PRE-DISASTER MITIGATION PLAN
FOR
THE CROW INDIAN RESERVATON

June 2007

Prepared by: Crow Tribe PDM Steering Committee
With technical assistance from Cossitt Consulting

CROW INDIAN RESERVATION
PRE-DISASTER MITIGATION PLAN
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Resolution of Adoption- CROW TRIBE

RESOLUTION Number:_____

A RESOLUTION TO APPROVE AND ADOPT
THE CROW INDIAN RESERVATION PRE-DISASTER MITIGATION PLAN

WHEREAS, the Crow Tribe has prepared a Pre-Disaster Mitigation Plan ("the Plan");

WHEREAS, the Plan covers the entire Crow Indian Reservation; and

WHEREAS, the Plan meets all requirements of the Interim Final Rule published in the Federal Register on February 26, 2003, at 44 CFR Part 201 as part of the Disaster Mitigation Act of 2000;

NOW, THEREFORE BE IT RESOLVED,

The Pre-Disaster Mitigation Plan for the Crow Tribe is approved and adopted.

The Pre-Disaster Mitigation Plan for the Crow Tribe is to be followed and incorporated into planning for the Crow Indian Reservation.

PASSED and APPROVED by the Crow Tribal Council this ____ day of _____, 200_.

FOR THE CROW TRIBE

By: _____
Carl Venne, Chairman

Attest: _____

Print Name: _____

Resolution of Adoption- Lodge Grass

RESOLUTION Number:_____

A RESOLUTION TO APPROVE AND ADOPT
THE CROW INDIAN RESERVATION PRE-DISASTER MITIGATION PLAN

WHEREAS, the Crow Tribe has prepared a Pre-Disaster Mitigation Plan ("the Plan");

WHEREAS, the Plan covers the entire Crow Indian Reservation and the incorporated community of Lodge Grass; and

WHEREAS, the Plan meets all requirements of the Interim Final Rule published in the Federal Register on February 26, 2003, at 44 CFR Part 201 as part of the Disaster Mitigation Act of 2000;

NOW, THEREFORE BE IT RESOLVED by the Town Council of Lodge Grass, Montana:

The Pre-Disaster Mitigation Plan for the Crow Tribe is approved and adopted.

The Pre-Disaster Mitigation Plan for the Crow Tribe is to be followed and incorporated into planning for the town of Lodge Grass.

The Town of Lodge Grass will work and cooperate with the Crow Tribe to implement the Pre-Disaster Mitigation Plan.

PASSED and APPROVED by the Crow Tribal Council this ____ day of _____, 200_.

FOR THE TOWN OF LODGE GRASS

By: _____
Daryl Bends, Mayor of Lodge Grass

Attest: _____

Print Name: _____

Executive Summary

The Crow Indian Reservation and the incorporated town of Lodge Grass intend to become disaster resistant by preparing and implementing this Pre-Disaster Mitigation (PDM) Plan. The plan identifies hazards and mitigation measures to reduce or prevent effects of those hazards, and raises the awareness about the importance of taking personal and collective (public and private) responsibility for reasonably foreseeable natural disasters.

The plan was developed with leadership from Crow Tribal Administration and Town of Lodge Grass. Throughout the process, from identifying hazards to developing mitigation measures, efforts were made to encourage public involvement and to draw all interested parties into the preparation of the plan whether formally at the series of public meetings, or informally through one-on-one conversations. A Steering Committee oversaw the preparation of the plan by a contractor. The mitigation goals, objectives, actions and projects were developed from information identified at public meetings.

The natural disasters of most concern to participants in the planning process were (in order of priority) winter storms, power outages, wildland fire, hazardous materials, flooding, emergency communications, and extreme winter cold. Each of these priority hazards and other hazards is profiled in the plan with a discussion of historic occurrences and vulnerability.

Generally speaking, there are no specific patterns to the ways in which various disasters strike the Reservation. Just about any area of the Reservation has potential for effects from drought, winter storms, wildfire, severe thunderstorms, and wind storms.

Ten goals with corresponding objectives and projects were developed for the identified hazards of concern:

1. Improve emergency response and general disaster preparedness
2. Improve ability to respond to severe winter weather
3. Reduce effects of power outages
4. Reduce potential for fires and improve fire response
5. Reduce effect of Hazardous Materials and Transportation-Related Accidents and Disasters
6. Reduce effects of flooding.
7. Improve Emergency Communications
8. Reduce effects of drought
9. Reduce impacts from downed tree limbs from high winds, ice storm, and heavy snow (specific to Lodge Grass)
10. Reduce potential for spread of disease and injury from loose animals (specific to Lodge Grass)

This plan serves all of the Crow Indian Reservation and the incorporated municipality of Lodge Grass. Lodge Grass is also included in the Big Horn County Pre-Disaster Mitigation Plan.

ACRONYMS USED IN THIS PLAN

BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
CWPP	Community Wildfire Protection Plan
DES	Disaster and Emergency Services
DNRC	Department of Natural Resources and Conservation
EMS	Emergency Medical Services
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map (prepared by FEMA)
FSA	Farm Service Agency (US Department of Agriculture)
FWP	Montana Fish, Wildlife and Parks
HFRA	Healthy Forests Recreation Act
IHS	Indian Health Service
LEPC	Local Emergency Planning Committee
MACO	Montana Association of Counties
MDOT	Montana Department of Transportation
MFWP	Montana Fish, Wildlife and Parks
NFIP	National Flood Insurance Program
NFP	National Fire Plan
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
PDM	Pre-Disaster Mitigation
PPE	Personal Protective Equipment
SCBA	Self Contained Breathing Apparatus
SHELDUS	Spatial Hazard Events and Losses Database for the United States
TERC	Tribal Emergency Response Commission
USGS	U.S. Geological Survey
WUI	Wildland Urban Interface

CHAPTER 1: INTRODUCTION

Authority

The Crow Tribe intends for the Crow Reservation to become disaster resistant by preparing and implementing this Pre-Disaster Mitigation (PDM) Plan. The incorporated town of Lodge Grass, the only incorporated town within the exterior boundaries of the Reservation, is also participating in this Pre-Disaster Mitigation Plan. The plan identifies mitigation measures to be taken, sets priorities, and raises the awareness about the importance of taking personal and collective (public and private) responsibility for reasonably foreseeable natural disasters.

The Disaster Mitigation Act of 2000, passed by the U.S. Congress, stated in its findings that greater emphasis needed to be placed at state, local, and tribal government levels on identifying risks from natural disasters, implementing measures to reduce losses from natural disasters, and ensuring that critical services and facilities of communities will continue to function after a natural disaster. The purpose of the Disaster Mitigation Act is to reduce losses resulting from natural disasters, and to provide a source of pre-disaster hazard mitigation funding to assist those states, local governments, and Indian tribes with approved plans and strategies for implementing effective hazard mitigation measures. This plan meets requirements of the Interim Final Rule published in the Federal Register on February 26, 2003, at 44 CFR Part 201, which specifies the criteria for local Pre-Disaster Mitigation Plans

The Crow Tribe signed treaties with the U.S. Government in 1825, 1851, and 1868. The Reservation was established in 1851, with an area that covered much of eastern Montana and northeastern Wyoming. The area of the Reservation was reduced with lands ceded in 1868, 1882, 1891, and 1904.

In 2001, the Crow Tribe repealed its 1948 constitution and instituted a new constitution and By-Laws that established three branches of government—executive, legislative, and judicial. The executive branch is headed by the tribal Chairman. Legislative branch members represent six geographic districts.

The authority for the town of Lodge Grass to prepare this plan is in Montana State law (MCA 10-3-401), which gives local governments the authority to plan for disasters and emergencies (Jelinski). Lodge Grass also participated in the Big Horn County Pre-Disaster Mitigation Plan.

The Crow have elected to submit this plan through the State of Montana's Disaster and Emergency Services Division. Funding for the development of the plan came from the Montana Disaster and Emergency Services Division. The Crow provided in-kind services to provide the matching contribution for the state's funding.

Scope and Plan Organization

This plan is organized into five major chapters.

- Chapter 1. Introduction

This chapter provides background material to put the plan and mitigation strategies into the context of the Crow Reservation's unique assets, resources, and hazards. This chapter includes a general description of land uses and development trends on the Reservation.

- Chapter 2. Planning Process

This chapter describes how the plan was developed, including public involvement.

- Chapter 3. Hazard Evaluation and Risk Assessment

This chapter identifies the type, location, and extent of natural hazards that can affect the Reservation. It also describes the Reservation's vulnerability in terms of critical facilities and potential dollar losses.

- Chapter 4. Mitigation Strategy

This chapter includes the long-term goals and specific mitigation actions and projects intended to reduce the effects of each hazard. It includes an action plan for plan implementation.

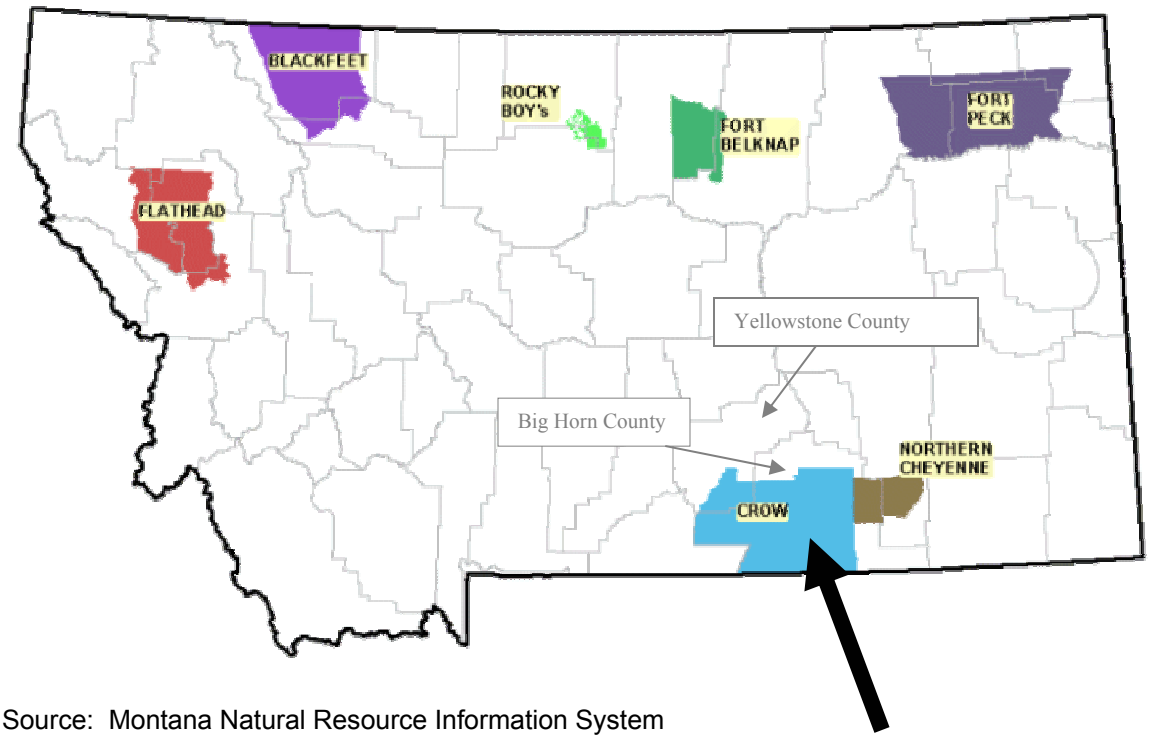
- Chapter 5. Plan Maintenance

This chapter describes how the plan is to be maintained and kept current.

Preparation of the Plan

Each of the signing entities to the plan, Crow Indian Tribe and the town of Lodge Grass, participated in the development of the plan through the Steering Committee, specifically by providing data, helping to set priorities, and identifying mitigation projects. Throughout the process, from identifying hazards to developing mitigation measures, public involvement was encouraged at a variety of levels. (Details of public involvement are included in Chapter 2.) The Crow Tribe hired Cossitt Consulting of Park City, Montana to assist in developing the plan, including writing the plan document.

Figure 1.1 Location of the Crow Indian Reservation in Montana



Source: Montana Natural Resource Information System

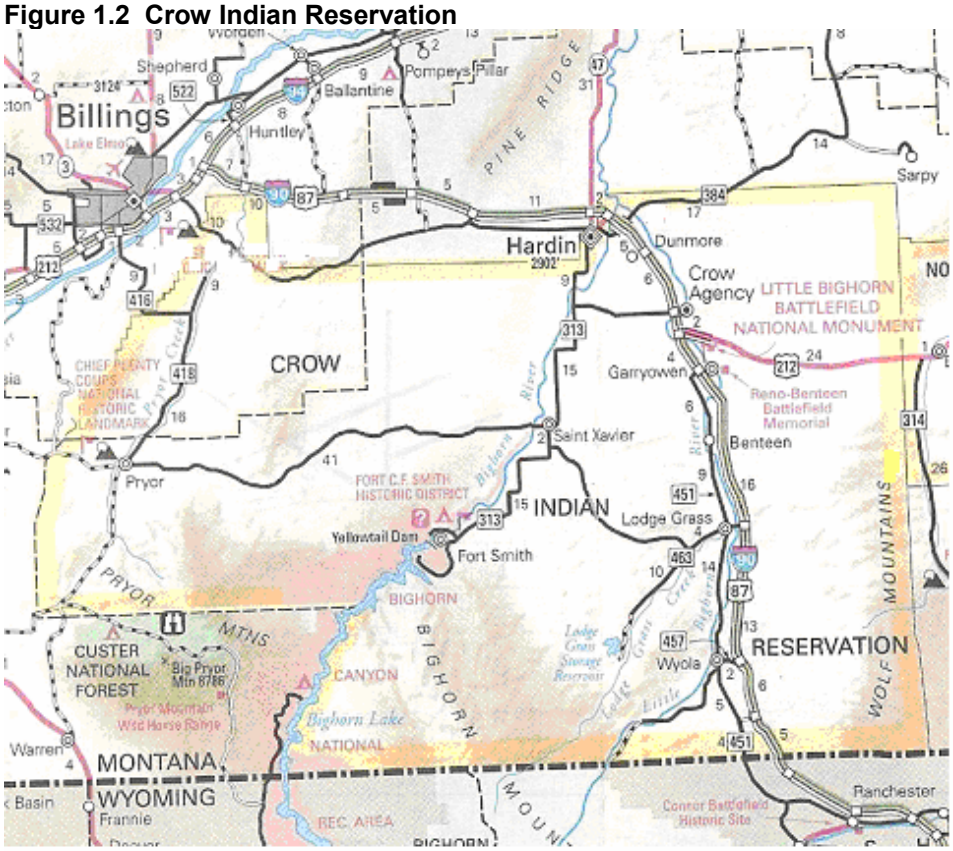
Project Area Description

General

The project area for this plan is the Crow Indian Reservation. The tribe is Apsaalooke, misinterpreted into the English word, "Crow." (Montana official state travel information website)

The Crow Reservation is located in southeastern Montana and encompasses 2,296,000 acres in portions of Big Horn and Yellowstone Counties. The Reservation is approximately 60 miles in width and 40 miles in length. (Crow Tribe 2002)

Figure 1.2 Crow Indian Reservation



Source: Montana 2002-2003 Highway Map

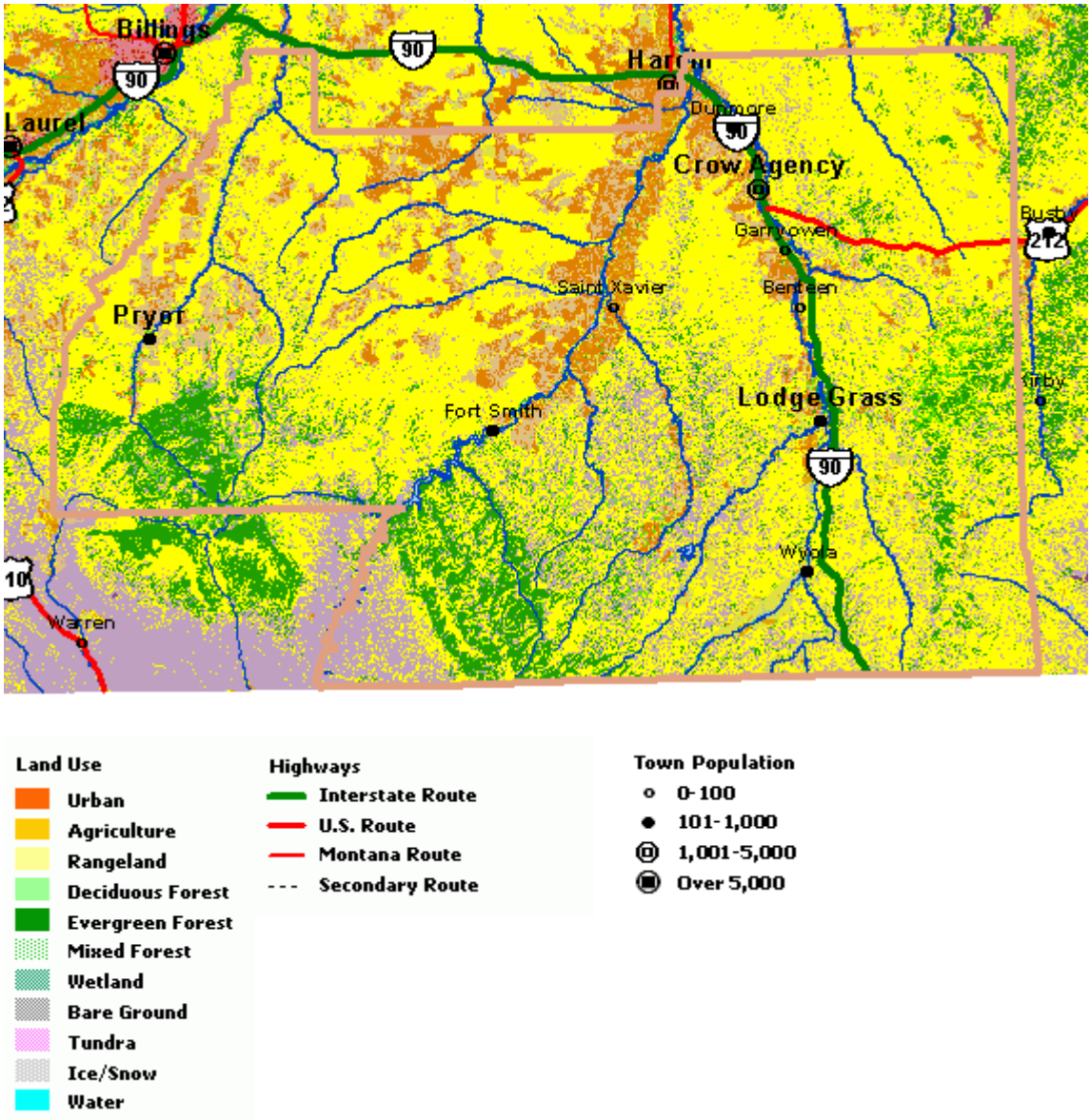
Physical Characteristics

Topography and Vegetation

The Crow Reservation has varied topography--mountains, rolling hills, high plains, and alluvial bottoms. Elevation ranges from 3,000 feet at the lowest point to 9,200 feet at the highest point in the Big Horn Mountains. There are three principle mountain formations—the Wolf Mountains to the southeast and Pryor and Big Horn Mountains to the west and southwest. Alluvial bottomlands are located along the Bighorn River, Little Bighorn River, and Pryor Creek drainage systems.

The mountainous areas include grasslands, shrubland (including sage brush), evergreen, and mixed forest areas. The prairie and rolling hills are primarily grass and shrubland (also including sage brush). Cropland areas are generally along the river bottoms, although there are some dryland crop areas on benches above the valleys. (Montana Natural Resource Information System-Vegetation Map)

Figure 1.3 Crow Reservation Land Use and Vegetation



Source: Montana Natural Resource Information System – Land Information – Land Use

The Crow Reservation is dominated by gently sloping to very steep, shallow to very deep, well drained, sandy, loamy and clayey textured soils. These soils were formed in semi-consolidated sedimentary beds, baked sandstone and shale, colluvium and alluvium on sedimentary plains, hills, mountains, and valleys (Crow Tribe 2002).

Water Resources

There are three major drainage basins on the Crow Reservation—Lower Big Horn River, Little Big Horn River, and Pryor Creek. The Big Horn River and Little Big Horn Rivers have their headwaters in Wyoming and flow northward into the Crow Reservation. Pryor Creek headwaters are on the Reservation. Other drainages include Lodge Grass Creek,

Rotten Grass Creek, Soap Creek, and Pass Creek, and headwaters of Rosebud Creek (North Fork and South Fork Rosebud Creek). All of these drainages are part of the Yellowstone River basin.

There are three major holding dams on the reservation—Yellowtail (consisting of two dams) on the Big Horn River, and Willow Creek (in Lodge Grass Creek drainage southwest of Lodge Grass). There are two diversion dams—one on the Big Horn River about 10 miles south of Hardin, and the other at Crow Agency on the Little Big Horn River.

There are several irrigation canals on the reservation. All of the systems within the exterior boundaries of the Crow Indian Reservation are managed by the BIA (although some headgates may be directly operated and controlled by the Bureau of Reclamation). The systems serve areas on the Big Horn River from Fort Smith to Hardin, Little Big Horn Valley, Lodge Grass Creek, and Wyola. (Bruckner)

Groundwater underlies most of the reservation, although depth to groundwater can vary from less than 100 feet in alluvial aquifers to more than 600 feet on upper benches. There are numerous natural springs in the hills and mountains and scattered throughout the reservation. (Crow Tribe 2002)

Mineral Resources

Mineral resources on the Crow Reservation include coal, oil, natural gas (including coalbed methane gas), sand and gravel, bentonite, and gypsum. (Crow Tribe 2002). Oil exploration and development increased in 2006.

Oil well (on top of hill), developed in 2006 southwest of Crow Agency

Areas that have produced oil and gas on the or near the reservation include Soap Creek, Lodge Grass, Gray Blanket, Hardin, Toluka, and Ash Creek. (Crow Tribe 2002)

Coal deposits lie along the eastern portion of the reservation. Coal bed methane is found in these same areas. (U.S. Department of Interior 2002). It is estimated that the

Crow Tribe controls mineral rights of an area with potential for between 700-800 million tons of coal (Crow Tribe 2002). The area of greatest potential for coal bed methane is in the southeastern corner of the reservation (U.S. Department of Interior 2002).

Wildlife

The Crow Indian Reservation provides habitat for a wide range of wildlife species. It is estimated that 79 species of mammals, 260 species of birds, five species of amphibians, 14 species of reptiles, and 19 species of fish are found on the Crow reservation at some time during the year. Big game species include pronghorn antelope, elk, white-tailed and mule deer, buffalo, and black bear. Game birds include Merriam's turkey, mourning dove, blue grouse, ruffed grouse, sharp-tailed grouse, sage grouse, chukar partridge, ring-necked pheasant, and gray partridge. Fur bearers include beaver, muskrat, lynx, bobcat, black bear, raccoon, red fox, coyote, badger, striped skunk, western spotted skunk, mink, ermine, and long-tailed weasel. (Crow Tribe 2002)

Population

Crow Tribe enrollment data indicate that U.S. Bureau of the Census decennial census undercounts total residents on the Crow Reservation. According to the 2000 census, there were 6,894 persons of all races living on the Crow Reservation, of which 5,165 (75%) were American Indian. According to Crow Tribe enrollment data, a total of 7,739 tribal members lived on the reservation as of December 2003 (Rau). This indicates an undercount by the census of approximately 2,000 Indians.

Total tribal enrollment in December 2005 was 10,927, which included 3,188 persons who lived off the reservation (Rau).

In 2000, the census reported 37.7% of the total population on the Crow Reservation was less than 18 years of age. By comparison, Montana's population under age 18 constituted 25.5% of the total population. (U.S. Census Bureau)

Eighty-five percent of Crow Tribe members speak Crow as their first language. (Montana official state travel information website)

Table 1.1 Population Changes 1990-2000 and Housing Information

	2000	1990	change 1990-2000	# of Housing Units in 2000	Seasonal Housing Units in 2000
Lodge Grass	510	517	-7	164	2
Crow Agency	1,552	1,446	106	361	2
Fort Smith	122	--	--	143	81
Muddy Cluster	627	387	240	160	3
Pryor	628	654	-26	197	4
St.Xavier	67	--	--	36	9
Wyola	186	--	--	57	1

Source: US Census Bureau

Economy

Agriculture is the historic economic base of the Crow Indian Reservation. Other natural resource-based sectors of the economy include coal, oil and gas, timer, and sand and gravel operations. The Absaloka coal mine, located approximately five miles outside of the reservation's northern boundary, extracts minerals held in trust for the Crow Tribe and employs between 40 and 75 Crow tribal members. The BIA Forest Department manages the reservation's forest resource. Timber units are generally leased to non-Indian interests for harvesting. Retail business establishments on the reservation are primarily small food and convenience stores. Tribal and federal (e.g., BIA and IHS) governments are the largest employers. (Crow Tribe 2002)

Income and Poverty

Per capita income on the Crow Indian Reservation in 1999 was $9,440, compared to the national per capita income of $21,587 (U.S. Bureau of the Census-Table DP-3). In 1999, 35% of all Indians on the Reservation were at or below poverty level, compared to a national poverty rate of 12%. (U.S. Bureau of the Census-Summary File SF-3)

Land Ownership

Ownership of surface lands on Reservation lands includes Crow Tribe (455,719 acres and 20% of total surface), individually allotted trust (1,035,850 acres; 45% of total surface), and private fee acreage (804,431 acres; 35% of total). The "split estate" of mineral ownership and surface ownership results in a mineral ownership pattern that is different from surface ownership. The Crow Tribe owns 20% of minerals (405,888 acres), individually allotted trust accounts for 41% (824,427 acres), and private acreage accounts for 39% (804,431 acres). (Crow Tribe 2002)

Transportation

Main transportation routes on the Crow Indian Reservation consist of federal interstate (I-90), state highways, county roads, and BIA roads. (Hembree, Spencer, Driftwood)

The Burlington Northern and Santa Fe Railroad generally parallels the interstate from Billings to Sheridan, Wyoming. There is also another spur line that extends north from Wyoming into the coal fields around Decker in the southeast corner of the county.

The area's major airport is the Big Horn County airport, located off-reservation at Hardin. Fort Smith has a 50' wide paved runway, 3800 feet long with no services. (Big Horn County Homeland Security Strategy)

Table 1.2 Major Transportation Routes

Road Name	Local Reference	
Interstate 90	Billings to Sheridan, Wyoming	Interstate Highway
Highway 212	Highway 212	Interstate Highway
384	Hardin to Sanders (Sarpy-Tullock road)	Montana Department of Transportation
313	Hardin-Fort Smith	Montana Department of Transportation
463	I-90 to Lodge Grass to Willow Creek Dam	Montana Department of Transportation
451	Garryowen-Montana line; highway just west of I-90	Montana Department of Transportation
457	Connector from I-90 to Wyola	Montana Department of Transportation
416	Billings to Highway 418	Montana Department of Transportation
418	From 416-418 junction to Pryor	In transition---see below
Old Highway 87	Billings- Hardin	Montana Department of Transportation
	Pryor to St. Xavier	BIA
	St. Xavier to Highway 463	BIA
	Crow Agency to Highway 313	BIA

Sources: Hembree, Montana Department of Transportation

Land Use

Land uses on the reservation include agricultural (livestock grazing and crop production), timber, and developed areas (including communities). Of the approximately 1.5 million surface acres in tribal and individual allotted trust ownership, approximately 68% is grazing rangeland, 12% dry cropland, 3% irrigated cropland, 15% forest, 1% wildland, and 1% developed areas. (Crow Tribe 2002)

Communities

The following information on communities is excerpted from the *Crow Natural, Socio-Economic and Cultural Resources Assessment and Conditions Report* (2002) unless other wise noted.

Crow Agency

Crow Agency is the centralized business community for tribal members. It is headquarters for Crow Tribal Administration, and BIA program offices for the Crow Indian Reservation. Medical facilities include the IHS hospital, “Awe-Kualawaache” nursing home, and dialysis center. Little Bighorn College (the Tribal Community College) is also located in Crow Agency. Crow Agency public school serves K-6 grades. There is a U.S. post office. The public water supply and wastewater systems are severely overworked and in need of maintenance. The Little Bighorn Battlefield National Monument is located just south of Crow Agency.


Little Big Horn College in Crow Agency

Lodge Grass

Lodge Grass is the only incorporated town on the reservation. The town has a grocery store, gas station, post office, IHS Clinic, and K-12 public school system. Lodge Grass is 21 miles south of Crow Agency.

The mayor of Lodge Grass and town staff participated in both the Crow Reservation and Big Horn County PDM plans. The town operates city water and sewer systems, which are in serious need of upgrade and repair. (Lavato)

Pryor

Pryor is located in the western portion of the reservation, more than 40 miles from the nearest reservation town (St. Xavier) and about 60 miles from Crow Agency. The town has an IHS clinic, private Catholic school, K-12 public school, post office, one small gas station and a café. There are no grocery stores at Pryor. The next closest town for food and essentials is Billings, located about 25 miles away. The community has public water and wastewater systems.

Wyola

Wyola is approximately 35 miles south of Crow Agency and about 10 miles north of the Wyoming border. The town has a café, K-8 Elementary school, post office, and public water and wastewater system. (Big Horn County 2006)

Fort Smith and Yellowtail Government Camp

The communities of Fort Smith and the Yellowtail Government Camp are located approximately 40 miles southwest of Crow Agency. There are separate public water supplies for each community.

The Yellowtail Government Camp provides residences for federal employees for the Yellowtail Dam and Big Horn Canyon Reservoir area. The local elementary school is also located at the Yellowtail Government Camp.

The community of Fort Smith is tied directly to the recreation resource provided by the reservoir. The community is split by Highway 313. Lots are almost entirely for mobile homes north of the highway and mixed use south of the highway.

There are two dams along the Big Horn River near these communities. The upstream dam that contains Big Horn Lake is approximately 500 feet high and produces hydroelectric power. There is also a smaller dam downstream. The Ok-A-Beh Marina is located on Big Horn Lake to the southwest of the Yellowtail Government Camp.

This area has a growing seasonal population. According to the 2000 census there were 143 residences in the general Fort Smith area, of which 81 were seasonal residences. (Big Horn County 2006)

Saint Xavier

Saint Xavier is located between Crow Agency and Fort Smith on Highway 314 along the Big Horn River. The Pretty Eagle private school is at the site of a Catholic missionary school built over a century ago. The community has a post office and some residences. Generally the area is scattered development. (Big Horn County 2006)

Garryowen

Garryowen is located approximately four miles south of Crow Agency. There are no definable community boundaries to the community and development in the area is less than one residence per forty acres. The area includes the Reno-Benteen Battlefield Memorial, a gas station, convenience store, gift store, and restaurant (all in one facility), and a separate museum building (which was not operating as a museum in 2006). (Big Horn County 2006)

Benteen

Benteen is located approximately 10 miles south of Crow Agency. There are no identifiable community boundaries, but state maps show the site of Benteen between Interstate 90 (to the east) and the railroad tracks (to the west). There are scattered residences in the area at a density of less than one per forty acres. (Big Horn County 2006)

Dunmore

Dunmore is located about six miles north of Crow Agency along Interstate 90. There are no definable community boundaries to Dunmore and development in the area is less than one residence per forty acres. (Big Horn County 2006)

Recreation and Visitor Attractions

There are many recreation sites and events on the Crow Reservation. The Crow Tribe requires persons who are not members of the Crow Tribe to obtain licenses and permits for recreation on reservation lands. The permits and licenses are intended to control trespass in sensitive areas. (Crow Tribe 2002)

Recreation opportunities, sites, and attractions include (excerpted from *Crow Natural, Socio-Economic and Cultural Resources Assessment*):

- Annual Crow Fair and Rodeo "Tepee Capital of the World," held at Crow Agency every August. The event lasts several days and attracts thousands of persons. (2006 attendance estimate was 15,000) (Driftwood)

Crow Fair
Photo from Montana Official State Travel Information site;
http://indiannations.visitmt.com/crow.shtm

- Little Bighorn Battlefield National Monument has an annual visitation of approximately 400,000 persons per year. The battlefield, just south of Crow Agency, encompasses 800 acres. A battle re-enactment is held south of Hardin every year and has become a large tourist attraction.

- Bighorn Canyon National Recreation Area includes Yellowtail Dam and Bighorn Lake. The lake is 71 miles long and extends into Wyoming. The area provides fishing, water sports, and camping.

- The Big Horn River Fishery is one of the premier fishing destinations in the nation, with huge rainbow and brown trout. The fishery was created with

construction of the Yellowtail Dam. South of the dam the water is cool and nutrient-rich, providing excellent sport fish habitat.

- Chief Plenty Coups Park and Museum, located in Pryor, preserves the log home of Chief Plenty Coups, last Chief of the Crow Indians, and also includes a museum, interpretive displays, and picnic sites.

- The Reno Benteen Battlefield, and Garryowen monuments commemorate Indian victory over the seventh Calvary and are in conjunction with the Little Bighorn Battlefield National Monument.

- Bighorn Canyon cuts a 1,000 foot fault segment in the Pryor Mountains. It is home to a herd of wild, free roaming horses believed to be descended from the first Spanish horses that may have arrived as early as the 1700s.

- Veterans Park in Crow Agency

Veterans Park in Crow Agency

<u>Cultural Committee Recommendations</u>

Recommendations from the Crow Cultural Committee for preservation of Apsaalooke tradition and culture as cited in the *Crow Natural, Socio-Economic and Cultural Resources Assessment* include:

1. *We consider human remains sacred. When we lay our deceased loved ones to rest, that is the last time we touch them. Whatever we put on them does not belong to anyone, nobody can claim these items, and*

we consecrate them back to our Creator. To disturb them is sacrilegious.

   a. *Recent disturbance – Have the individual who disturbs the human remains put it back.*
   b. *Since it is the responsibility of county coroners to handle deceased persons, we would elect to have the county coroner interment the human remains.*

2. *Disturbance while digging or excavating. Stop all proceedings; contact the Apsaalooke Culture Affairs Department, State Historical Office and the appropriate County Coroner. Extreme caution is used when making improvements and developments. If possible, avoid removing these preservation of rocks and boulders, they may be Final Resting-Places.*

3. *Human Remains. Human remains and burial sites are Sacred to the Apsaalooke. We have consecrated our departed ones back to our Creator. At all cost, do not disturb nor remove any further items. If accidentally disturbed, notify the Apsaalooke Cultural Affairs Department, Apsaalooke Nation, and the appropriate County Coroner.*

4. *Historical Sites – To be identified and protected from destruction.*

5. *Sacred Sites – To be identified and protected from destruction and contamination.*

6. *Plants – Medicinal plants and roots identified shall be protected from destruction, contamination and eradication.*

7. *Ceremonial Foods – Shall be protected from contamination and eradication.*

8. *Trees – Trees, brush and shrubs identified shall be protected and preserved from contamination, destruction, and eradication. Willows along waterways have taken a lot of abusing to the point of non-existence.*

9. *Animals – Animals used in religious ritual and ceremonies shall be protected and preserved from injury and extinction. Animals used as ceremonial foods shall be protected and preserved from injury and extinction.*

Land Management

The Crow Tribe adopted zoning regulations in the 1960s. In 1999, the Crow Tribal Planning and Zoning Commission identified a need to update the zoning regulations, but has not yet completed the update. The Crow Tribe does not have floodplain regulations that have been approved by FEMA. The Crow Reservation cannot qualify for federal flood insurance without floodplain regulations. (Taft)

Lodge Grass has zoning but no comprehensive land use plan. Due to an extremely constrained budget and limited staff resources, zoning enforcement and permitting is ad hoc at best in Lodge Grass. (Big Horn County 2006)

State of Montana and Big Horn County also regulate on deeded lands within the exterior boundaries of the Crow Reservation. Big Horn County has a growth policy (comprehensive plan) that was adopted in 2002. The County has subdivision regulations, floodplain regulations, and sanitation regulations. There is no county zoning. An electrical/plumbing/mechanical permit may be required by the state of Montana for new noncommercial construction and is required for all commercial construction. Waste water systems are required to be permitted. State and county sanitation regulations require wastewater systems to be located at least 100 feet ouside of the 100-year floodplain. The floodplain regulations allow for other types of construction (including homes) in the floodplain. There are no FEMA Flood Insurance Rate Maps for the Crow Reservation, other than for the incorporated municipality of Lodge Grass. Flood-prone Area Maps were developed in 1973 for various river segments.

Environmental review of new development for tribal lands and tribally allotted lands may be conducted by the BIA, IHS, or Northern Cheyenne Tribe depending on the type of development. Generally, those developments funded with federal assistance would be reviewed by either the BIA or IHS. Developments on tribal lands would be reviewed by the Tribe. Developments on deeded lands are subject to local and state requirements.

Development Trends

The following are likely future development trends:

- Population increase. Population will continue to increase on the Reservation. In 1998, IHS projected that in the year 2010 the population of enrolled members of the Crow Tribe would be 13,770—a 35% increase over the population in the year 2000. (Crow Tribe 2002)

- Increased demand for housing. As population grows the need for housing will expand, and the need is already significant. The 2002 *Crow Natural, Socio-Economic and Cultural Resources Assessment and Conditions Report* indicated that in 2002 there was a waiting list of 300 families needing housing.

- Coal bed methane and oil development. A portion of the coal-rich Powder River Basin lies along the eastern boundary of the Crow Reservation. The Powder River Basin has the potential for thousands of wells at full development. Associated with the development will be new roads, fences, pumphouses, pipelines, power lines, and water discharge facilities. (Big Horn County 2006) Development is tied to market demand and price of other fuels. Oil development is also expanding on the Reservation (Driftwood).

- Increasing number of seasonal vacation homes. The number of seasonal vacation homes is increasing on the reservation. According to the U.S. census, there were 117 seasonal homes in Big Horn County in 1980, 198 seasonal

homes in 1990, and 296 seasonal homes in 2000. The world-class fishing on the Big Horn River is an especially popular location for these seasonal homes. As noted above, more than half the homes in the Fort Smith area are seasonal homes.

Emergency Services

The Crow Reservation was in the process of finalizing its Emergency Operation Plan at the time this PDM plan was being prepared.

The Northern Cheyenne Tribal Emergency Response Services have executed general mutual aid agreements with nearby emergency response services. Any disaster within the Reservation may require the coordination, communication, and cooperation of several governments and federal agencies. These include:

- Bureau of Indian Affairs
- Indian Health Service
- Big Horn County
- Yellowstone County
- Sheridan County (Wyoming)
- Northern Cheyenne Tribe
- Montana Department of Natural Resources and Conservation
- Montana DES
- US Department of Interior
- US Department of Health and Human Services
- US Federal Emergency Management Agency

Fire protection is provided by BIA Fire Department, Crow Agency Volunteer Fire Department, Big Horn County Fire Department, Fort Smith Volunteer Fire Department, Lodge Grass Volunteer Fire Department, National Park Service (Bighorn Recreation Area). The Crow Agency Volunteer Fire Department, Big Horn County Fire Department, Fort Smith Volunteer Fire Department, and Lodge Grass Volunteer Fire Department have equipment to suppress structural fires. Pryor is served with fire protection from the Billings area (Blue Creek and/or Lockwood Fire Departments).

Law enforcement is provided by BIA Police Department (office in Crow Agency), which has jurisdiction for Indians on the reservation, Big Horn County Sheriff's Office (office in Hardin), which has jurisdiction for non-Indians on the reservation, and the Montana Highway Patrol which has jurisdiction on I-90 through the reservation.

Ambulance service is contracted by Big Horn County Ambulance out of Hardin. One ambulance is also stationed at the IHS hospital in Crow Agency. Another ambulance is stationed at the Lodge Grass clinic in the evenings after the clinic closes. Extrication for vehicular accidents is provided with equipment stationed at Hardin. Ambulance service for Pryor is from Billings.

There is a 24-hour/day emergency dispatch center at the Crow BIA Law Enforcement Center.

Climate and Weather

The Crow Indian Reservation is located east of the Continental Divide and subject to continental weather patterns. In general summers are hotter, winters are colder, precipitation is less evenly distributed, skies are sunnier, and winds are stronger than on the west side of the divide. (Western Regional Climate Center, Climate of Montana)

Within this general climate type, there is a wide range of temperature and precipitation within the Reservation, affected primarily by the mountains. The Pryor and Big Horn Mountain on the Crow Reservation have been called a "launching pad" for severe weather events that can extend into North Dakota, South Dakota, and Minnesota (Scarlett). The Reservation is subject to air masses from several sources. During winter the coldest weather comes from Arctic air, typically followed by warmer air from the Pacific. Spring and early summer are typically the wettest times of the year. Heaviest rain is usually associated with storms from the Gulf of Mexico, mostly in May and June. Midsummer afternoon thunderstorms occur about 25 to 35 days per year. (USDA Soil Conservation)

Precipitation can range from as low as 15 inches average annual to as high as 24 to 28 inches per year (in the Big Horn Mountains in the southwest portion of the reservation). The areas with greatest precipitation are the Big Horn, Pryor, and Wolf Mountains. (NRIS maps)

Annual snowfall varies throughout the reservation . The Yellowtail Dam area has historically received 33 inches of snowfall per year. Pryor receives 66 inches. (Western Regional Climate Center)

Much of the precipitation in the mountains falls as snow. Snow in the Big Horn Mountains near the Wyoming border can reach depths of 100 inches or more on some slopes before it starts to melt in the Spring. (USDA Soil Conservation)

Table 1.3 Average Temperatures: Crow Agency (1898-1991) and Yellowtail (1948-2005)

	Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*Ann*
Crow Agency													
Ave max	33	39	48	62	72	81	90	88	77	65	48	38	62
Ave min	6	11	21	31	40	49	54	50	41	31	20	11	30
Yellowtail Dam													
Ave max	38	44	51	62	71	80	90	90	78	65	49	41	63
Ave min	16	22	27	36	45	53	58	57	48	39	28	20	37

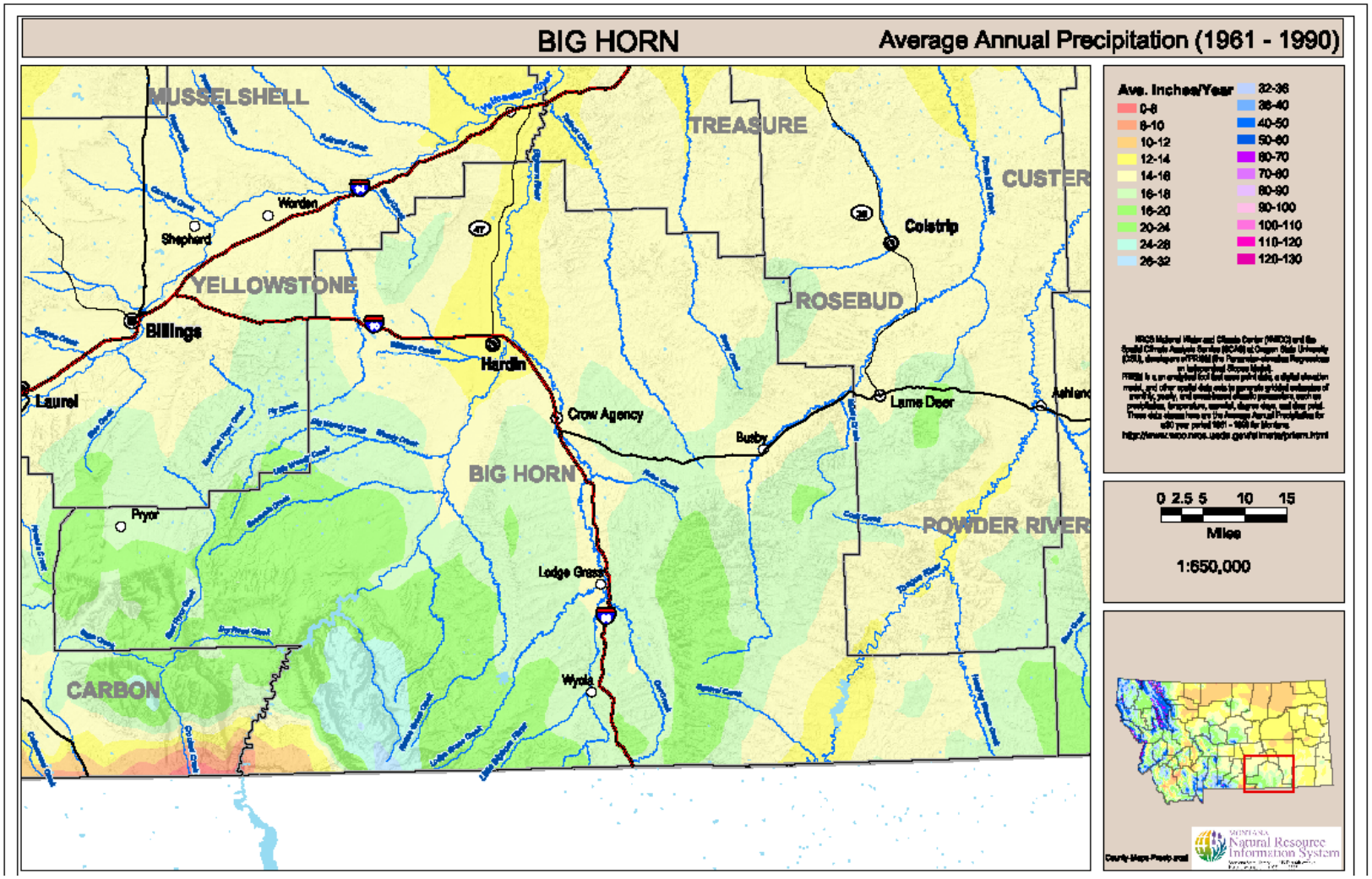
Source: Western Regional Climate Center Period of Record Monthly Climate Summary (wrcc.dri.edu)

The Crow Indian Reservation holds two temperature records for the state of Montana. Yellowtail Dam is recorded as having the highest average annual temperature (50.2 degrees) and Crow Agency has the record for longest consecutive period with temperatures 90 degrees or above (38 days between July and September, 1922). (Western Regional Climate Center, http://wrcc.dri.edu/htmlfiles/state.extremes.html)

Areas in Montana lying east of the continental divide are windier than areas to the west of the divide. Mountainous areas tend to have the strongest winds. The Pryor, Big Horn, and Wolf Mountains have average annual wind speeds of greater than 15 miles per hour with some localized areas with speeds of 19 miles per hour or more in the Big Horn and Pryor Mountains.

Extreme weather on the reservation can include storms with hail, lightning, and strong winds and winter storms with ice, snow, cold temperatures, and strong winds. Weather events are covered in more detail in Chapter 3.

Figure 1.4 Precipitation



Source: Montana Natural Resource Information System

CHAPTER 2: PLANNING PROCESS

This chapter describes:

- The overall approach to developing the plan
- The plan process, including:
    - Who was involved in the planning process and how they were involved
    - Efforts to involve the general public
    - Efforts to involve various interests including government, business, education, and others

Supporting documents in Appendix A include:

- List of persons invited to participate in the Steering Committee
- Meeting agendas
- Meeting summaries
- Meeting sign-in sheets
- Flyers and News Releases
- Correspondence

OVERALL APPROACH AND PHILOSOPHY

The development of this plan was based on the premise that plans with the greatest likelihood of being implemented are those with local momentum, where individuals in the communities are actively involved and have a stake in accomplishing goals and specific projects.

From the start it was important that any and all interested individuals be offered the opportunity to participate. Special efforts were made to invite persons representing a wide variety of interests that could be affected by disasters or that play a role in disaster response. It was recognized that a number of individuals were critical resources to the process by virtue of their knowledge and expertise. The process sought to engage both these knowledgeable individuals and the general public.

Many individuals committed considerable amounts of personal time to the development of this plan. Without their involvement, this document would not have been possible.

PROCESS

There were several key participants in the process:

- Crow Tribal Administration—initiated the effort and approved the plan
- Lodge Grass (incorporated community)—participated in meetings (mayor and staff) and approved the plan
- Steering Committee—functioned as the planning committee (see detailed description below under “Public Involvement and Outreach”)
- General Public—encouraged to participate, attend steering committee meetings, stay informed (See more under “Public Involvement and Outreach”)

- Tribal DES Coordinator (William Driftwood and Susette Nanto Spang)—lead staff persons on the Reservation for coordinating with the contractor and liaison for local expertise
- Consultant—provided the staffing to research and write the report, facilitating discussion at meetings leading to hazard evaluation and risk assessment, mitigation measures (goals, objectives, projects)
- Technical Experts and Others. A number of individuals were contacted for information and were extremely responsive and helpful. These included the following:

    - Steering Committee Members
    - Tribal, BIA, and IHS staff

There were four basic elements of plan development:

1. Getting Started - Understanding the Purpose and Need for the Plan
2. Public Involvement and Outreach
3. Document Development and Review
4. Plan Approval

The process for each of these elements is described in more detail below.

Getting Started - Understanding the Purpose and Need for the Plan

The Crow Tribe initiated the efforts to develop a PDM plan and already had a good understanding of the need for such a plan. In 2006, the Crow Tribe contracted technical assistance from Anne Cossitt of Cossitt Consulting to complete the PDM Plan.

Anne Cossitt met with the Tribal Emergency Response Commission (TERC) in April and in June to review purpose and approach to the plan, identify how best to involve various interests and the general public, identify existing plans, studies, reports, and technical information, and to finalize the schedule and products. The agenda and meeting notes for that meeting are included in this chapter.

The DES Coordinator sent out more than 150 letters of invitation to participate in the Steering Committee to a number of individuals representing a variety of interests on and off the Reservation. (List of invitees included in Appendix A.)

Public Involvement and Outreach

Efforts to include and inform the public included Steering Committee participation and public outreach via meeting announcements and general information.

Steering Committee

The Steering Committee functioned as a planning committee and guided the work of the consultant. The role of the Steering Committee was to represent a wide range of interests, serve as a technical resource, guide the planning process, and finally, review the draft document for accuracy and completeness.

The intent was to start with persons already participating on the TERC and to encourage participation from business interests, utilities, health care, education, transportation infrastructure, news media, law enforcement, neighboring communities, and local, state, and federal government. Lists of who attended each meeting are included in Appendix A.

The Steering Committee met three times:

- June 12, 2006
- August 1, 2006
- September 6, 2006

Prior to each meeting, written reminders with the date, time, and location of the meeting were sent out to each person on the list.

At the first meeting, participants identified and prioritized hazards and identified any existing plans or other resources relevant to the plan. At the second meeting, the committee worked on drafting goals. At the third meeting, participants identified and prioritized projects.

Prioritizing Hazards at First Steering Committee Meeting

Meetings were facilitated by the planning consultant according to an agenda developed prior to each meeting. Each meeting began with introductions and an explanation of the purpose of the plan and planning process. Anyone who attended a meeting, whether they had been formally invited or had learned of the meeting through news articles or other means, was welcome to participate and comment. Following each meeting, a meeting summary was prepared, copies of which are included in Appendix A.

Public Outreach and Information

Public outreach began immediately following the kick-off meeting in April 2006. The consultant prepared news releases related to each meeting. The Crow Tribe Public Relations Office then sent the information to various publications, including the Billings Gazette, local newspapers, and the tribal newspaper.

Articles explained the purpose of the meetings, planning schedule, summary of past meetings, topic for upcoming meetings, and provided contact information. Flyers of each meeting were also posted around the Reservation. Notices and flyers were also sent regarding the availability of the draft document for public review.

Document Development and Review

Cossitt Consulting prepared the plan document, starting with elements identified at the various meetings. A detailed description of the methodology for the hazard evaluation and risk assessment for the PDM is included in Chapter 3. That chapter also discusses the review and incorporation of existing plans, studies, reports, and technical information.

Following the third Steering Committee meeting, a draft of the entire document was assembled and provided for public review. The comment period was open for 30 days and closed on May 1, 2007.

No comments were received from the public on the draft. The DES Coordinator recommended adding objectives related to impacts to community water supply and wastewater systems from drought and flooding, and clarifying assessment of stormwater systems (roads, bridges, culvert sizing) is a reservation-wide need.

Plan Approval

Following incorporation of the comments received, the plan was finalized. Draft resolutions were prepared for adoption and approval of the plan by the Crow Tribe and town of Lodge Grass. These signed resolutions can be found on the first pages of this plan.

CHAPTER 3: HAZARD EVALUATION AND RISK ASSESSMENT

This chapter identifies:

- Hazards to which the Crow Reservation is susceptible
- What effects the hazards can have on the Reservation's physical, social, and economic assets
- Which areas are most vulnerable to damage from these hazards
- Estimated costs of damage

Chapter 3 includes a short description of **methodology**; followed by a list of the **identified hazards** discussed in this chapter and rationale for why each hazard was included; detailed profiles of each hazard type including **historic occurrences** and **vulnerability and potential loss estimates**; and **assets** and **vulnerable populations** that could be affected by various hazards.

METHODOLOGY

Hazards were evaluated for the Crow Reservation and the incorporated municipality of Lodge Grass as follows:

1. Identify hazards that may occur. Hazards that may occur were identified through:
    a. The Steering Committee meetings (steering committee and members of the public identified past disasters and potential future disasters)
    b. Review of hazard lists in the FEMA "How-to Guide: Understanding your Risks" and initial research on websites recommended in the Guide
    c. Review of the State of Montana Multi-Hazard Mitigation Plan and Statewide Hazard Assessment
    d. Researching other plans and reports (included at the end of this plan under "Sources")
    e. Discussion with technical experts (included in the Sources section at the end of the chapter) including the NOAA staff in Billings to review weather-related natural hazards and obtain storm information

2. Prioritize the hazards and focus on the most prevalent. Hazards were initially prioritized at the 1st Steering Committee meeting and refined at subsequent meetings and with research results.

3. Profile hazard events. This step basically answers the question, "How bad can it get?" This included:
    a. Identifying maps of the geographic extent of hazards that can occur in predictable areas
    b. Obtaining data on historical occurrences—frequency, severity, and related damage from other plans and technical information sources. Most data sources organize information by county and state—information specific to Indian reservations is not generally readily available. For hazards for which there was little verifiable data of occurrence on the

Reservation, information on potential severity and probability of occurrence was obtained from occurrences elsewhere in Montana or the nation.

c. Hazards Participants at the first meeting ranked potential consequences and probability for occurrence of various hazards as high, medium, or low. Rankings were intuitive and refined as necessary later in the process with research results.

Vulnerability and potential loss estimates were assessed for the Crow Indian Reservation and town of Lodge Grass as follows:

1. Identify the future potential for the hazard to result in damages. Potential for future damage was assessed primarily by looking at past occurrences, by considering information from existing plans and technical information sources, and by considering factors that could potentially increase risk (such as new development in hazard areas).

2. Inventory assets and identify what might be affected by the different hazard events. This includes structures, operations important to the Reservation's economy as well as vulnerable populations that could be particularly hard-hit by a disaster. Critical facilities and vulnerable populations were identified at the 2nd steering committee meeting. The inventories of assets (later in this chapter) include location and replacement value, based on information provided by representatives of the various facilities, and by comparison to similar structures elsewhere in Big Horn County (and documented in the Big Horn County Pre-Disaster Mitigation Plan). Because most of the hazards on the Reservation can essentially occur anywhere, the inventory of assets is included as a separate section in this chapter. Information from the inventory of assets was used to identify potential dollar loss estimates for each specific hazard.

3. Estimate losses. Loss estimates were based on:

    a. Data on actual costs of past occurrences
    b. Consideration of the value of assets at risk (detail included in the section on "Assets and Vulnerable Populations" at the end of this chapter)
    c. Estimates from other information sources, such as the Montana Multi-Hazard Mitigation Plan

Because most hazards can vary in location and extent, and because there are no existing detailed hazard maps for the Reservation, estimates are often presented as a cost range.

IDENTIFIED HAZARDS

Table 3.1 includes potential hazards for the Crow Indian Reservation, how and why they were identified, how they were ranked at the first public meeting, and where they are discussed in this chapter.

Table 3.1 Crow Indian Reservation Hazards

Type	How Identified	Why Identified	Location in Chapter 3	Rank at Public Meeting
Winter Storms	Steering Committee Meetings	History of Past Events	Severe Winter Weather	1(tie)
Power Outages	Steering Committee Meeting	History of Past Events	Power Outages-Loss of Communication	1 (tie)
Wildland Fire	Steering Committee Meetings	History of Past Events	Wildland Fire	2
Hazardous Materials	Steering Committee Meetings	Concern about potential future event; history of past events	Hazardous Materials/Transportation-Related Accidents	3
Floods	Steering Committee Meetings	History of Past Events	Flooding	4
Emergency Communications	Steering Committee Meetings	History of Past Events	Power Outages-Loss of Communication	5
Extreme Winter cold	Steering Committee Meetings	History of Past Events	Severe Winter Weather	6
High Winds	Steering Committee Meetings	History of Past Events	Severe Thunderstorms (Hail, Wind, Tornadoes)	
Train Derailment	Steering Committee Meetings	History of Past Events; potential for hazardous materials accident	Hazardous Materials/Transportation-Related Accidents	
Lightning	Steering Committee Meetings	History of Past Events	Severe Thunderstorms (Hail, Wind, Tornadoes)	
Drought	Steering Committee Meetings	History of Past Events	Drought/Extreme Heat	
Acts of Terrorism	Steering Committee Meetings	Concern about potential future event		
Epidemics	Steering Committee Meetings	History of Past Events (statewide); Concerns about avian flu, etc.	Epidemics	
Communication Issues	Steering Committee Meetings	History of Past Events	Power Outages-Loss of Communication	

FEMA identifies seven major hazards (floods, earthquakes, tsunamis, tornadoes, coastal storms, landslides, and wildfires) to be considered in the development of a Pre-Disaster Mitigation Plan. Of these seven major hazards, five were identified as potential hazards on the Crow Indian Reservation--floods, earthquakes, tornadoes, landslides, and wildfires.

The other two hazards were eliminated from more detailed review in this plan for the following reasons:

- Tsunamis are not applicable to the Crow Indian Reservation.
- Coastal storms are not applicable to the Crow Indian Reservation.

SEVERE WINTER WEATHER

Extreme winter weather events occur throughout the Crow Indian Reservation and include blizzards, extreme cold temperatures, heavy snow, ice storms, and freezes. Winter weather events have occurred on the Reservation from October through May. Storm events can be particularly severe in spring or fall. Storms may start off in relatively warm weather and snow can be accompanied by thunder.

A blizzard is defined as a storm with winds over 35 mph with snow and blowing snow reducing visibility to near zero. (Montana Multi-Hazard Mitigation Plan)

Annual snowfall varies throughout the Reservation from 33 inches at Yellowtail Dam to 66 inches in Pryor. High mountain snow depths can reach 100 inches or more before the snow begins to thaw and melt. (Western Regional Climate Center)

Historic Occurrences

Between 1996 and 2004, NOAA recorded 23 heavy snow, ice storm, and/or blizzard events in Big Horn County. Details of some of these events are included Table 3.2. There has been one winter storm-related disaster declaration for Big Horn County, a FEMA disaster declaration in 2001 which provided $705,644 in federal assistance to Big Horn County and the Crow Reservation.

Table 3.2 Major Winter Storm Events in and around Crow Reservation

Date	Event Type	Description
March 1999	Blizzard	Heavy snow across southern Montana. Winds as high as 40 mph across southern Big Horn County. 9 inches of snow in Pryor.
September 2000	Heavy Snow	Heavy snow causes trees, still in full foliage, to break, and many areas experienced power outages
April 2001	Heavy Snow	4-5 foot drifts in Kirby/Decker area. 8-10 inches of snow in Busby (started as thundersnow). An estimated 600 power poles were knocked down by heavy, wet snow, ice, and wind. Thousands of people were without power for up to 7 days. The hardest hit area was along Route 314 in the Kirby/Decker area.
January 2003	Heavy Snow	Snow across the county; 12 inches at Yellowtail
December 2003	Blizzard	3-day snowstorm/blizzard from December 26-28. Snowdrifts ranged from 2-4 feet across the county. Approximately 2,500 travelers were stranded in Hardin and Crow Agency
October 2005	Heavy Snow	Heavy snow across reservation downs trees and power lines. Power out in some locations for up to 3 days. Some homes had to be evacuated. Trees were still leafed out, so snow broke branches and there was a lot debris removal.

Sources: NOAA data and accounts from public meetings

Annual snowfall varies throughout the reservation. Average annual snowfall at Yellowtail Dam is 33 inches. Pryor receives 66 inches. Record snowfall was recorded in the winter of 1972-1973, when Wyola received a total of 140 inches, more than a third of which fell in April. (Western Regional Climate Center)

Average monthly minimum winter temperatures range from 5.9 degrees (Crow Agency in January) to 22 degrees (Yellowtail in February). Crow Agency has the lowest recorded temperature on the reservation (-50 degrees on February 15, 1936). (Western Regional Climate Center)

Vulnerability and Potential Loss Estimate

Given the location of the Crow Indian Reservation and weather patterns for the northcentral United States, winter storms, ice storms, and related colder weather events will continue to be a potential hazard for the reservation.

Winter storm events on the reservation can have a number of potential effects and related costs:

- Loss of human life and other human risks—hypothermia, stranded motorists
- Damage to electric transmission facilities and power outages
- Livestock loss and stress
- Crop losses and stress
- Road closures
- Snow removal and sanding
- Business interruption expenses
- Overtime loads on emergency and law enforcement personnel
- Vehicle accidents
- Other property damage (e.g., structural to buildings, losses due to power outages, such as broken water pipes from lack of heat, etc.)
- Damage to trees and vegetation (spring and fall storms with heavy wet snow) and related damage to buildings (e.g., trees and tree limbs falling on buildings)

In addition, the reservation faces challenges of winter storm related safety factors for isolated rural residents. The Reservation has had periods where roads are closed for days. Providing emergency services to persons located far from emergency operations bases can be hazardous for emergency personnel as well. Even in good weather, it can take an hour or more for emergency equipment to reach some sites on the Reservation.

Based on past events, the single most costly effect of winter storms for structures in the area of the Crow Indian Reservation is for damage to power facilities. It cost approximately $750,000-$850,000 to repair/replace the downed power lines from the 2001 event in the Kirby-Decker area. There may some localized effects on individual structures, primarily dependent on roof structure. (Rugg).

Based on information from the SHELDUS Data Base, 10 winter weather events in Big Horn County between 1960 and 2000 resulted in a total of $547,314 in property damage and $264,974 in crop damage (amounts not adjusted for inflation). The single highest event in the SHELDUS data base was for $576,000.

In summary, cost of a single weather event for structures (primarily power lines) could be approximately $800,000 or more. This estimate does not include costs of business interruption, livestock and/or crop loss, emergency response time, etc. Based on past

events and public comment, the severity of a winter weather event is moderate to high, and the probability of occurrence is high for a winter storm and moderate to high for extreme cold.

POWER OUTAGES/LOSS OF COMMUNICATION

Power outages were identified at the public steering committee meetings as a serious issue for critical facilities and for general residents on the Crow Indian Reservation.

Power outages can be caused by local hazard events (e.g., ice storm or wind storm), accidents (e.g., vehicle accidents resulting in downed lines), wildfires, or from events outside of the Reservation that affect power generation or transmission. Hazards most likely to cause serious damage to power and communications facilities are those that will affect overhead transmission. The key hazards are high winds and ice. Flooding can affect a pole or poles in a few places, but high winds and ice can take out hundreds of poles at a time.

Problems with communications facilities were also identified by participants in the PDM planning process. These included areas with no cell phone coverage, and problems with communication between the various emergency responder systems (Crow, County, etc.). Statewide, there is currently an effort to improve communications interoperability among different emergency responders, and the Crow Tribe is participating in this multi-agency, multi-county effort.

Historic Occurrences

The Crow Indian Reservation has a history of power outages, the most severe of which are typically associated with ice storms, although they can occur any time of the year. Power outages can last up to several days or more. In April 2001, for example, thousands of people in the eastern part of the Reservation were without power for seven days.

Communications have been an issue in the past, as evidenced by comments at the PDM planning meetings. According to the 2000 census, 12.6% of all housing units on the reservation had no telephone service. (U.S. Census 2000, Table DP-4)

Vulnerability and Potential Loss Estimate

The Crow Reservation has a high potential for occurrence and a moderate to high potential for severity of power outages. Risks include potential for loss of life/injury and economic losses.

- Downed lines sparking fires
- Risk to people who need power-supplied medical equipment (e.g., people in their own homes without back-up power generation)
- Damage to appliances, etc.; loss of frozen goods
- Inability to heat structures, cook, etc., in places where electricity is the source, resulting damage to water lines, etc.

- Inability to run public water supply and wastewater systems--Not all communities have back-up power
- Inability to access fuel--Gas stations don't typically have back-up power supplies. Without power, no gas can be pumped
- Inability to access information via radio, television (without battery-operated appliances or back-up power)
- Lack of function for power-generated communications (e.g., some residential phones, some communications facilities such as radio stations without back-up power)
- Business interruption and associated costs

Most communities do not have a reliable back-up power supply for water and wastewater. This could create significant issues in times of prolonged power outages. This is a particular issue for limited water storage supplies.

There is no single consolidated record-keeping that identifies which facilities (schools, clinics, government administration buildings, and other) have back-up power. Persons attending the steering committee meetings indicated that the hospital in Crow Agency sometimes shuts down the outpatient unit to save power during outages. During the process of developing this PDM plan, the DES Coordinator began contacting each school on the reservation to identify if they had a reliable back-up power source and whether facilities at the school could be used as an emergency shelter. As a result of these efforts, the Lodge Grass school had its back-up generator problems fixed. The back-up generator at the school has capacity to run the Lodge Grass public water and wastewater systems in an emergency situation. The town has no other back-up power supply.

Lodge Grass Public School

Communication problems may continue to be a problem, but efforts to improve interoperability among emergency responders will help to improve future emergency communications. In 2005 the first NOAA Weather Radio All-Hazard transmitter in Big Horn County was installed. This will improve the communication of local weather and all

types of hazards to residents on the Reservation. The transmitter provides 24-hour information that can be accessed by standard radios.

Costs of power outages, excluding direct effects to power generation and transmission as a result of other hazards, are not well-documented. Nationally, power outages and black-outs are estimated to cost approximately $80 billion, when costs of business interruption are included (Berkeley Lab). Approximately 2% of the national total is residential loss, 73% is commercial, and 25% is industrial. Economic losses on the reservation could be hundreds of thousands of dollars or more per incident, based on these national estimates.

Costs of communication outages and problems include potential for injury and loss of human life. Participants and historic information indicate a moderate probability of communication outages and a moderate to high potential for severity of impacts.

WILDLAND FIRE

A wildland or rangeland fire is an uncontrolled fire, a term which includes grass fires, forest fires, and scrub fires, human caused or natural in origin. The wildland/urban interface (WUI) is defined as the zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuel. (Montana Multi-Hazard Mitigation Plan)

Wildland fire can occur throughout the Crow Indian Reservation.

Historic Occurrences

Participants at the first Steering Committee meeting indicated wildfires were a serious problem on the reservation. They specifically mentioned a fire that took place in the 1980s on Little Bighorn Battlefield. At the June meeting they talked about potential consequences of a wildfire at the annual Crow Fair. Crow Fair draws huge crowds—up to 15,000 people camped over several days at the Crow Fairgrounds (Driftwood). A fire then did occur at the 2006 Crow Fair. Although actual consequences of the fire were not severe, participants at the September meeting were concerned about future fires and how to avoid problems. Access throughout the encampment, emergency notification, and evacuation plans were all discussed.

Large past fires on the Reservation include:

- Crow Fire that burned almost to Wyoming – 1990s (exact date unknown)
- St. Xavier Fire August 1996
- Wildfire near Lodge Grass 2001

The wildfire season that took place during the process of planning this PDM Plan was particularly destructive. Fires in southcentral Montana (Stillwater, Yellowstone, and Big Horn Counties) began early in June and July 2006. By mid-July, the Pine Ridge Fire, north of the Crow Reservation had burned 121,000 acres. In the Crow Reservation area, there were a number of concurrent or back-to-back fires in July – fires on the Northern Cheyenne Reservation (just west of the Crow Reservation), and on the Crow Reservation at St. Xavier (“Birthday 2” Fire), Lodge Grass (“Owl” Fire), and other smaller

fires at Pryor and Crow Agency. (National Interagency Fire Center and Billings Gazette articles July 2006)

Information from the Bureau of Indian Affairs for the Crow Reservation indicates an average of 100 fires per year on the reservation. A total of 64,589 acres burned on the Crow Reservation in the 10 year period between 1987 and 1996, of which half was from a single large fire. (U.S. Bureau of Indian Affairs 1999)

Human-caused fires account for about 80% of all fires on the Crow Reservation and lightning-caused fires account for the remaining 20%. Human causes include arson, debris burning, miscellaneous (including fireworks), equipment use, railroad fires, children-caused fires, smoking related fires, and campfires. (U.S. Bureau of Indian Affairs 1999 and Collins)

Most of the human-caused fires are in an area described as “Fire Alley.” The Fire Alley corridor runs along Interstate 90 south of Hardin, along Highway 212 east of Crow Agency, and on Highway 1 west of Crow Agency. Fire Alley includes the at-risk communities of Benteen, Hardin, Crow Agency, Dunmore, Garryowen, Lodge Grass, Wyola, Muddy Cluster, Rosebud, and Busby. Approximately 55% of all fires between 1987 and 1996 on the Crow Reservation were in Fire Alley, a trend that continues at present. (U.S. Bureau of Indian Affairs 1999 and Collins)

Arson was identified as a significant issue at the Big Horn County Community Wildfire Protection planning process in 2005, which included participants from fire departments across the Crow Reservation and from the town of Lodge Grass. Participants in that planning process pointed out that abandoned vehicles, and vacant and abandoned homes are particular targets of arsonists. In one year in the town of Lodge Grass and vicinity, there were 72 arson fires (Redden).

Railroad fires accounted for approximately nine percent of all fires on the Crow Indian Reservation between 1987 and 1996. Fires started by equipment or machinery accounted for less than five percent of all fires on the Crow Reservation between 1987 and 1996. These few fires accounted for nearly 40% of all the acreage burned during the same period.

Debris burning has been a considerable issue in the past, accounting for approximately 20% of all fires on the Crow Reservation.

Lightning is a major source of ignition on the reservation and surrounding area. It is not uncommon for the Big Horn County to receive as many as 900 lightning strikes in a 24-hour period during the thunderstorm season. Lightning strikes are most likely in the

higher elevations—the Pryor, Big Horn, and Wolf mountains on the reservation. (Redden)

Between 1998 and 2004, Big Horn County was included in three different fire-related disaster declarations. In 2000, Big Horn County was included with more than 40 counties and Indian Reservations in Montana in a Presidential Disaster Declaration. The county was also included in two USDA Secretarial Declarations (1999 and 2001).

Vulnerability and Potential Loss Estimate

Based on history, risk and hazard assessment information in the Big Horn County Community Wildfire Protection Plan, and planning participants' comments, the potential of occurrence and severity of wildfire are high.

There are factors that increase vulnerability, which include scattered development and homesites in timbered areas, availability of water for suppression, and fuels conditions. There are also factors that reduce vulnerability and risk and these include the fire departments on the Reservation, and plans to manage wildland fire hazard and suppress fires--the BIA Fire Management Plan for the Crow Reservation (1999) and the Wildfire Hazard Assessment and Mitigation Plan for the Crow Reservation (2006).

The Crow Indian Reservation is served by fire departments shown in Table 3.3.

Members of all these departments participated in the development of the Big Horn County Community Wildfire Protection Plan (CWPP). The goals portion of that plan is attached as an Appendix to this plan.

Costs of suppressing a wildfire can be millions of dollars. It cost $3.5 million to suppress the 24,895 acre Windmill Complex Fire of 2003 near Busby (west of the Crow Reservation).

Other direct and indirect costs of wildland fire include:

- Structural damage/loss (e.g., buildings, fences, etc.)
- Loss of livestock, agricultural production
- Damage to roads and bridges
- Increased potential for weed invasion, erosion, and flash flooding after the fire
- Costs of evacuation and emergency shelter
- Business interruption and loss

Table 3.3 Summary of Fire Agency Capabilities and Staff on Crow Reservation

Department	Area Covered	Equipment Locations	Capabilities	Paid Staff	Volunteers
Big Horn County Fire Department	Entire county	Hardin Decker Kirby Lodge Grass Lodge Grass Creek (West of Lodge Grass) Dry Creek* Tullock * Pine Ridge*	Structural Fire Wildland Fire	17 FTE (county road staff—collateral fire duties)	4 in Decker 8 in Sarpy
BIA Forestry-Fire Management: Crow Indian Reservation	Crow Indian Reservation	Crow Agency and Pryor	Wildland Fire	20	0 (but there are approximately 200 trained firefighters available for paid on-call as Montana "Casual" Firefighers)
Crow Agency Volunteer Fire Department	5 mile radius around Crow Agency (primarily a corridor extending from the Dunmore exit to the Garryowen exit along I-90)	Crow Agency	Structural Fire Wildland Fire	0	6
Fort Smith Volunteer Fire Department	5 mile radius around Yellowtail Government Camp (Fort Smith)	Yellowtail Government Camp (Fort Smith)	Structural Fire Wildland Fire	0	20
Lodge Grass Volunteer Fire Department	From Reno Creek (south of Highway 212) to Wyoming border	Lodge Grass	Structural Fire Wildland Fire	0	13
National Park Service	Big Horn Canyon National Recreation Area	Yellowtail Government Camp (Fort Smith)	Wildland Fire	16 (all are regular staff with collateral fire duties)	0

Source: Big Horn County PDM-CWPP

HAZARDOUS MATERIALS/TRANSPORTATION-RELATED ACCIDENTS

Hazardous materials are chemical substances, which if released or misused, can pose a threat to the environment or public health. Hazardous materials come in the form of explosives, flammable and combustible substances, poison, and radioactive materials. These substances can be released because of transportation accidents, pipeline releases or accidents, or mechanical or human error at various facilities. (Montana Multi-Hazard Mitigation Plan) A hazardous material incident could occur anywhere on the Crow Indian Reservation.

As many as 500,000 products pose physical or health hazards and can be defined as "hazardous chemicals." Nationwide, most discharges are from fixed facilities (52%) and discharges from mobile facilities (railroads, trucking, etc.) are about 18%. (Montana Multi-Hazard Mitigation Plan)

Based on information received at the planning meetings, issues of concern for the Crow Reservation include hazardous spills of all types, including transportation-related spills and pipeline spills.

Transportation facilities on the Reservation include roads and highways, railroad, airport, and pipelines.

Fixed sources include non-mobile machinery, refineries, manufacturing plants, and numerous other fixed facilities. On or near the reservation, fixed facilities include the mines, oil and gas exploration and development facilities, water treatment facilities, and smaller fixed facilities including gas stations, and farm and ranch supply facilities.

Hazardous materials and transportation-related incidents can be tied in some cases to natural events, such as rain, ice, or snow creating slick conditions for transport, or extreme heat or cold that may cause conditions leading to railroad track misalignment.

Historic Occurrences

There have been a number of hazardous materials spills in and around the Crow Reservation. Many participants in the planning process identified an incident that occurred on October 17, 2005 when a semi-trailer loaded with sulfuric acid, ferric sulfate, acetone, car batteries, and gunpowder overturned on Interstate 90 near Crow Agency. The incident caused the evacuation of nearly 200 residents to the Crow Agency Civic Center where the American Red Cross had set up a temporary emergency shelter with cots and blankets. Fortunately, all were able to return home the next morning after a hazardous waste response team determined that there was only minor leakage of nonhazardous material inside the trailers. (Billings Gazette, October 18, 2005) The incident has raised awareness and concern on the Crow Reservation about hazardous materials incidents and need for emergency shelter, evacuation routes, etc.

Table 3.4 National Response Center Reported Spills 1990-2005 by Type

Type	#
Fixed	11
Continuous	2
Pipeline	5
Storage Tank	3
Railroad	6
Mobile	13
Unknown Sheen	1
Land	1
Total	42

Table 3.5 National Response Center Reported Spills 1990-2005 by Location

Location	#
Decker	16
Hardin	11
Lodge Grass	5
Fort Smith	3
Pipeline (no specific location)	3
Wyola	2
Aberdeen	1
Busby	1
Total	42

Source: National Response Center

The National Response Center is the national point of contact for reporting oil and chemical spills in the United States. Information is reported by county. Data for Big Horn County from the National Response Center for the period 1990 to 2005 indicated a total of 42 reported incidents.

The Montana DEQ also keeps a data base of reported incidents. The data are organized somewhat differently than that of the National Response Center website. DEQ spill data for Big Horn County for the period from January 1997 through April 15, 2005 indicated a total of 72 spill reports. Most related to vehicle accidents/incidents, some dealt with complaints about non-transportation related spills. (Coleman)

In the 31 year period between January 1975 and July 2005, there were 40 rail accidents in Big Horn County. Total cost in equipment and track was over $6 million. The highest single incident was $1.08 million in 1998. (Federal Railroad Administration)

Vulnerability and Potential Loss Estimate

The Crow Indian Reservation has potential for hazardous materials related accidents from both fixed and mobile sources.

Hazardous materials incidents can result in:

- injury or loss of life
- damage to structures (e.g., explosions)
- business interruption (e.g., during evacuations)

Between 1982 and 1991, there was an annual average of 6,774 hazardous materials transportation incidents nationwide that resulted in 10 deaths and 436 injuries. The most common type of transportation hazardous material incident is from highway crashes, followed by railroad incidents. (Montana Multi-Hazard Mitigation Plan)

The Billings Gazette cited statistics from the Association of American Railroads that 99.99% of hazardous materials that travel by rail make it safely. (February 28, 2005) Still the small percent can result in serious consequences. For example, an April 1996 rail crash in Alberton, Montana, resulted in the second largest chlorine spill in the history of the nation. One death and the evacuation of 1,000 people resulted. In February 1998, 48 rail cars rolled backward and downgrade into Helena. The crash caused an explosion that forced the evacuation of 2,000 people and cost $6 million. (Montana Multi-Hazard Mitigation Plan)

Potential losses can vary from relatively small spills and leaks to major events. Clean-up and damages are typically borne by the responsible party, but in some cases, effects can be widespread and far-reaching with public cost implications.

A single incident can have serious effects. In January 1999 a vehicle accident in Big Horn County resulted in a spill of 5,700 gallons of fuel oil, one of the largest transportation-related hazardous material spills in Montana in the ten years between 1993 and 2003.

The proximity of the rail line and Interstate 90 as a particular concern related to transportation of hazardous materials near population centers (e.g., Crow Agency) and major events (e.g., Crow Fair). The Interstate has a weigh station located between the north and south bound lanes, requiring trucks to exit and enter the station from the fast lane. There is a serious curve, the weigh station, and a bridge crossing the Little Big Horn River, all in close proximity.

Participants in the PDM planning process generally identified hazardous materials and transportation-related incidents as having a high probability of occurrence and high potential for severity of impacts. Historic data indicate train-related accidents have moderate probability of occurrence with moderate to high severity.

FLOODING

"A flood is a natural event for rivers and streams. Excess water from snowmelt, rainfall, or storm surge accumulates and overflows onto the banks and adjacent floodplains." (FEMA, *Understanding Your Risks*).

Flooding can occur throughout the Reservation as a result of snowmelt, widespread rainfall, or intense thunderstorms. High soil moisture, frozen ground, and rainfall on melting snowpacks contribute to the most severe floods (Zelt). In addition, there is potential for flooding from dam failure.

Major rivers and streams on the Crow Indian Reservation include the Bighorn River, Little Bighorn River (also referred to as the Little Horn), Lodge Grass Creek, Tongue River, Pryor Creek, and Rosebud Creek. In addition there are a number of tributaries to these rivers and creeks.

There are three major holding dams on the Reservation: Yellowtail on the Big Horn (two dams) in extreme canyon lands, and Lodge Grass Storage Reservoir in the foothills of the Big Horn Mountains. These dams have the potential to cause damage if they breach or fail, but they also function to reduce effects from upstream flooding. The Yellowtail Dam was estimated to have reduced flood damages by $90.4 million since its construction in 1966 (Bureau of Reclamation website).

The geographic extent of the 100-year flood (a flood that has a 1-percent chance of being equaled or exceeded in any given year) has been mapped for the town of Lodge Grass and portions of the county that are outside of the boundaries of the Crow Indian Reservation. Flood-prone areas have been mapped for sections of the Big Horn River on the Crow Reservation.

Historic Occurrences

Flooding on the Crow Reservation has occurred from storm events, snow melt, ice jams, and flash floods. Table 3.6 provides information on some historic flood events.

Participants at the PDM steering committee also described another flood (date unspecified) in Crow Agency that shut down the power pump and caused evacuation of a portion of the hospital.

The flood of 1978 was also mentioned by PDM planning participants. This flood was preceded by record amounts of precipitation. At each of the four weather monitoring stations, 1978 was the record-setting year for annual precipitation—26 inches at Crow Agency, 28 inches at Pryor, 28 inches at Yellowtail Dam, and 26 inches at Wyola. May 1978 holds the record for most precipitation received in any one month—8.14 inches at Crow Agency, 9.28 inches at Yellowtail, 8.65 inches at Wyola. (Western Regional Climate Center) Participants recalled that the 1978 floods took out bridges and isolated some communities, including Pryor.

Table 3.6 Selected Flood Events on the Crow Indian Reservation

Date	Location	Nature of Flood	Damage Estimate	Loss/Damage and Notes
May 1978	Flooding along Little Big Horn and Big Horn Rivers	Widespread rain on saturated soils combined with snowmelt runoff	$3.83 million in federal aid to local government; $.62 million to individuals (in 7 counties) Big Horn County alone lost 5,000 head of cattle	Part of widespread flooding in the Yellowstone River Basin on the Big Horn, Tongue, and Powder Rivers and the Yellowstone River from Billings to Miles City. In Big Horn County, most of the affected area was from flooding on the Little Big Horn River and the Big Horn River downstream of the confluence
Feb 1996	Crow Agency	Ice Jam	4 homes destroyed	An additional 50-60 homes were threatened by the jam

Sources:
Public Participation – steering committee meetings
"Storm Data and Unusual Weather Phenomena" May 1996-April 2005, NOAA
Environmental Setting of the Yellowstone River Basin (by Zelt, et.al)
US Army Corps of Engineers, CRREL. http://www.crrel.usace.army.mil/ierd/ijdb/
USDA Disaster Declaration Summary

Little Big Horn River near Crow Agency

The U.S. Army Corps of Engineers Cold Regions Research and Engineering Laboratory (CRREL) maintains records of recorded ice jams. Not all towns on the reservation are included in the data base (and not all ice jams are recorded). The CRREL data base indicates 12 ice jams in Crow Agency from 1932 to 1996, and 19 in Wyola between 1936 and 1971. Lodge Grass was not in the data base, but is known to have ice jams. Wyola, just south of Lodge Grass, ranks ninth among Montana towns with the most reported ice jams in Montana, and Montana has the most ice jams of any state in the nation (Montana Multi-Hazard Mitigation Plan). Ice jams are also reported to cause flooding northeast of Pryor (Storey).

Flash floods are events "occurring with little or no warning where water levels rise at an extremely fast rate." (FEMA, *Understanding Your Risks*)

Based on information from the SHELDUS data base, nine flood events between 1960 and 2000 resulted in $.85 million in property damage and $1 million in crop damage in Big Horn County. SHELDUS data is not always accurate, however, and the major flood of 1978 was not included in the data base.

Vulnerability and Potential Loss Estimates for a Flood from a Natural Event

For the purposes of this discussion, a natural event is any event that triggers a flood except for dam failure. Natural events include widespread precipitation, rapid snowmelt, ice jams, and localized heavy precipitation.

The geographic extent of flooding on the Crow Indian Reservation has not been determined with FEMA Flood Insurance Rate Maps (FIRMs), with the exception of the incorporated municipality of Lodge Grass. The FIRM maps indicate the area of the 100-year flood designation for major drainages. The 100-year flood designation applies to the area that has a 1% chance on average of flooding in any given year. The 100-year flood is also referred to as the base flood, a national standard that has been adopted for the National Flood Insurance Program (NFIP). (FEMA, *Understanding Your Risks)* There is actually a range of floods that could occur, other than just the 100-year flood. For example, an "annual flood" occurs much more frequently and produces less damage than a 100-year flood. The 100-year flood would produce much greater damage but occur less frequently.

The Crow Tribe and Big Horn County have periodically investigated the possibility of extending FIRM mapping to all applicable areas of the reservation, but without results.

The Big Horn County Floodplain Administrator has aerial photographs of the May 1978 that extended from Wyola to north of Hardin, which are useful to augment the FIRM maps and to identify past flood effects in areas with no FIRM maps.

FEMA administers the National Flood Insurance Program (NFIP). The NFIP is the only source of flood insurance in the country.

Incorporated Community of Lodge Grass

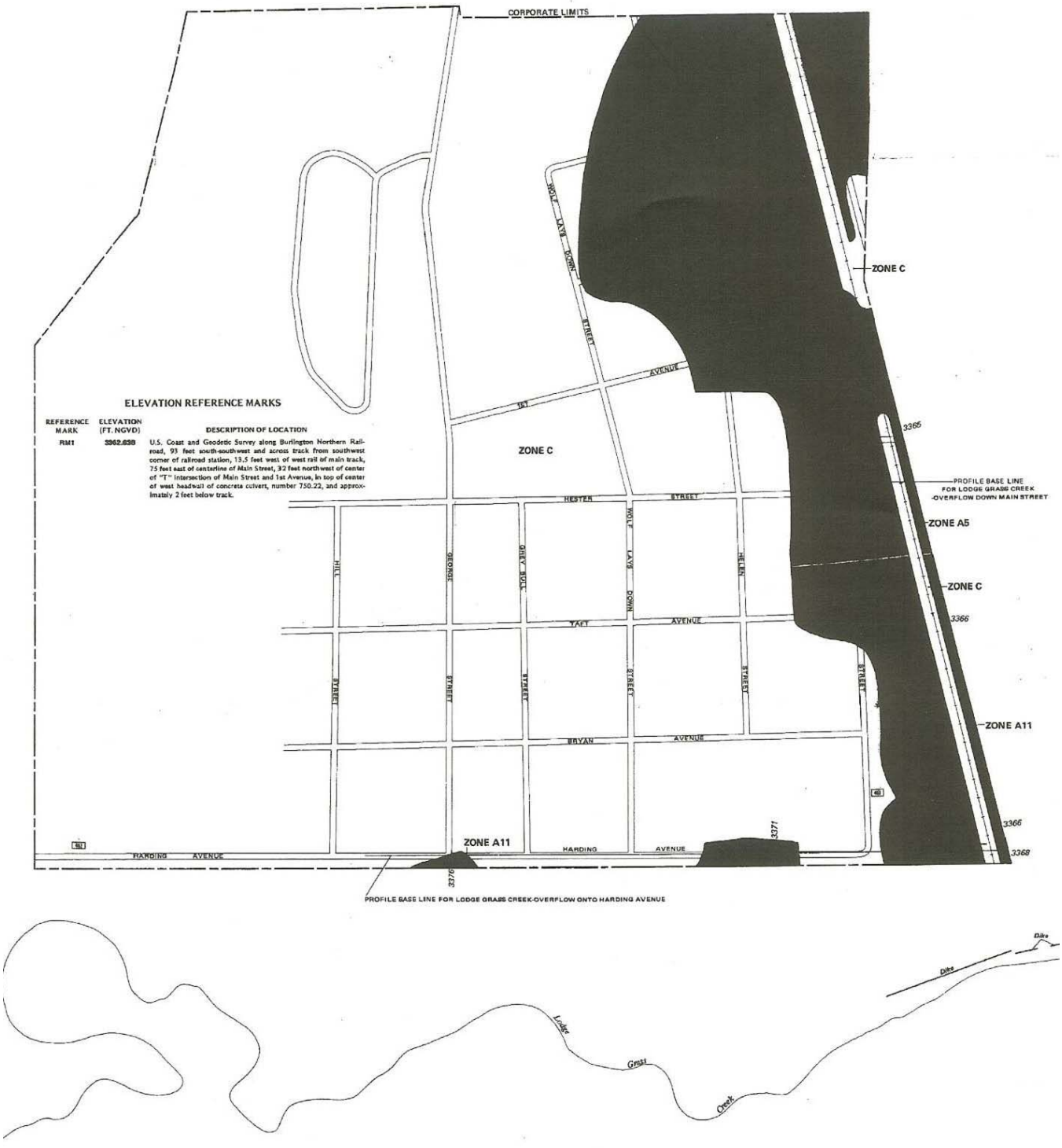
The town of Lodge Grass is the only area on the Reservation with a FIRM map.

Approximately one/quarter of the developed area of the town lies within Zone A (shaded in black on Figure 3.2), the area of the 100 year flood. The remainder of the town lies in Zone C, which includes areas of minimal flooding. Mandatory flood insurance purchase requirements apply in Zone A, but there are no current policies in effect in Lodge Grass (Heddin).

Figure 3.1 Aerial Photo of Lodge Grass, May 1978 flood

Source: Big Horn County Floodplain Administrator

Figure 3.2 FIRM Floodplain Map of Lodge Grass



Source: FEMA (Map Effective September 2, 1981)

Table 3.7 provides a potential loss estimate for a flood in Zone A, based on assessed market values. This is likely an underestimate since properties within the town that are not deeded are exempt from property taxes and would not be included in the calculations. In addition to the damage to structures and infrastructure (railroad and utilities), there would be additional costs associated with interruption of business.

Table 3.7 Potential Flood Loss in Lodge Grass in Zone A of the 100-year Flood Plain

Description	Market Value	Estimated % located in floodplain	Total vulnerable to Risk
Residential	1,630,198	10%	$163,020
Commercial	660,750	100%	$660,750
Railroad property	267,978	100%	$267,978
Utilities	32,473	50%	$16,237
Total			$1,527,984

Sources:
Montana Department of Revenue for tax year 2004 for property values
FEMA FIRM for Lodge Grass
Aerial photo of 1978 flood

Town hall buildings and other infrastructure are not located in Zone A. The public school is on a bench above the Lodge Grass Creek and Little Big Horn Rivers.

Storm drainage was cited as a serious issue in Lodge Grass. Just west of Highway 451, stormwater builds up in pools at the entrance to the town. In recent rain storms, water has backed up to the door steps of the post office and other downtown businesses. Ponding occurs in front of the grocery store as well.

Lodge Grass Creek just upstream from Lodge Grass

Beaver ponds are an ongoing and serious issue related to drainage. Beaver ponds back-up water flow in Lodge Grass Creek. When water flow is high, the ponds exacerbate flooding issues.

At the PDM steering committee meeting in June, the Lodge Grass Public Works director also identified fallen trees and debris on Lodge Grass Creek as another flooding problem for Lodge Grass.

Crow Agency

Although there is no FIRM for Crow Agency, there is aerial photography of the May 1978 flood. Based on that photo approximately 50 to 75 percent of the town area was inundated by that flood. Crow Agency is the seat of tribal government for the Crow Tribe.

Figure 3.3 Aerial Photo of Crow Agency, May 1978 flood

Source: Big Horn County Floodplain Administrator

Wyola

The main portion of the town of Wyola was not inundated by the 1978 flood (based on the aerial photos). Wyola has a high rate of ice jams which can cause localized flooding.

All Other Areas of the Reservation

Based on a map that shows population density in the Montana Multi-Hazard Mitigation Plan, the areas with the densest concentrations of population on the reservation are along the Big Horn River, Little Big Horn River, and Pryor Creek. All of the communities would have some potential for a flash flood event; many also have potential for ice jams.

Summary – Natural Flood Event

Table 3.8 Summary of potential loss impacts from natural event flooding in on the Crow Reservation

Type	Description	Potential Damage Estimates
Communities		
Lodge Grass	100-year flood inundation area as shown on FIRM flood map	$1.5 million or more
Crow Agency	As much as 50-70% of the town could be inundated based on area of 1978 flood	Potential for millions of dollars of damage.
All other areas of the reservaton:		
Agricultural	Partial to total loss (localized), reduced production	Total value of irrigated crops in Big Horn County is $23 million (based on 2004 irrigated crop acres, normal year yields, and 3-year average price) 5,000 head of cattle were lost in the 1978 spring floods
	Damage to irrigation facilities	Could be as high as $10,000 or more for individual problem areas[1]
Residential	Potential loss or damage to homes	$61,400 per unit based on the median value of Big Horn County housing units according to 2000 census
Railroad	Potential for interrupted service or track damage	Assessed value of railroad property in Big Horn County is $22.6 million
Water Supply & Sewage treatment facilities (generally located in proximity to rivers, streams)	Potential for inundation, eroding of distance from river bank	Replacement costs could be $3 million or more per system[2]
Roads, culverts and bridges	Washouts	County roads and bridge replacement costs: $240,000 per bridge (average); $90,000-$100,000/mile for graveled-paved county roads

[1] Based on events in Richland County
[2] based on information from Larry Vandersloot for Hardin

Although virtually all the reservation is subject to some sort of flood event, most have been localized either along a river or stretch of river or stream, or within areas of a

community as a result of storm drainage issues. Potential costs for a single major event, such as the 1978 floods, could be in the tens of million dollars or higher based on information in Table 3.8.

Participants identified a moderate potential for major flooding and potential for high severity of damage.

Vulnerability and Potential Loss Estimates for a Flood from a Dam Failure

The National Inventory of Dams provides information on dams by county. There are 82 dams in Big Horn County listed with the National Inventory of Dams. Six are classified as high hazard, four are classified as significant, and 72 are classified as low hazard. The following defines the high, significant, and low hazard ratings used by the National Inventory.

> High: Where failure or misoperation will probably cause loss of human life.
>
> Significant: where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns.
>
> Low: Where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

The high hazard dams on the Crow Indian Reservation are shown in Table 3.9. All high hazard dams are required to be inspected at least once every five years and to have an Emergency Operations Plan.

Table 3.9 High Hazard Dams on the Crow Indian Reservation

Dam	Year Built	Height	Storage (Acre Feet)	Owner	Closest Downstream Community
Yellowtail	1965	525	1,427,340	Bureau of Reclamation	Fort Smith
Yellowtail After Bay	1964	72	3,141	Bureau of Reclamation	Saint Xavier
Willow Creek Willow Creek Dike 1 Willow Creek Dike 2	1941	109	23,000	Bureau of Indian Affairs	Lodge Grass

Source: National Inventory of Dams

Yellowtail is a dam and storage facility of national significance. If the dam were to fail, floodwaters would not be stopped until they reach the next downstream dam facility in North Dakota. On the Crow Indian Reservation, effects would be catastrophic and immediate. Floodwaters would inundate the wide swath of the Big Horn River Valley, with backflow up drainages, including the Little Big Horn River. Floodwaters would reach Hardin in 2 hours 36 minutes and would crest there at 59 feet above the normal water elevation in the river. (Tauscher)

A literature search did not reveal any past dam failures on the Crow Reservation, nor were any identified in the public meetings.

At one of the public meetings for the Big Horn County PDM plan, a participant raised the issue of flushing flows from Yellowtail Dam, and this concern would also apply to the Crow Indian Reservation. The purpose of a flushing flow is to improve trout reproduction by flushing fine sediments from spawning gravels in the river. Additionally flushing flows reduce floating algae which is beneficial for irrigation systems as well. It is unclear if people with homes and other structures along the Big Horn River are aware of potential for flushing flows and potential effects on their property. (Big Horn County 2006)

The potential for dam failure is low, based on past experience and the procedures and safeguards required at high hazard dams. A dam failure would have severe results; catastrophic in the case of Yellowtail Dam. Losses for a high hazard dam have a probability for loss of life (certain loss of life in the case of Yellowtail Dam failure with no advance warning), and economic loss. Economic costs would be catastrophic in the event of failure of Yellowtail Dam.

SEVERE THUNDERSTORMS (INCLUDING HAIL, WIND, AND TORNADOES)

The Crow Indian Reservation is subject to severe thunderstorms that include lightning, hail, wind, and tornadoes throughout the Reservation. High wind events can also occur independent of a thunderstorm.

A severe thunderstorm is a thunderstorm that produces tornadoes, hail 0.75 inches or more in diameter, or winds of 50 knots (58 mph) or more. (Montana Multi-Hazard Mitigation Plan)

A tornado is a violently rotating column of air in contact with the ground and extending from the base of a thunderstorm. Tornadoes are categorized by the Fujita scale. The Fujita scale ranges from F0 (with estimated speeds less than 73 mph) to F5 (with estimated wind speeds greater than 261 mph). (Montana Multi-Hazard Mitigation Plan) The wind speeds are an estimate only. The Fujita scale is a damage scale. The worse the damage, the higher the F scale rating. In southeastern Montana, with plenty of wide open spaces, if a really wide, fast spinning tornado hits an area with no buildings, it still has a rating of F0. (Fransen)

High wind events (exceeding 50 knots) can and do occur at any time of the year. When combined with snow, they create blizzard conditions and are discussed in the section above on “Winter Storms.” Straight line winds are more likely to occur in eastern Montana than tornadoes, and the resulting damage can be worse than a tornado. (Fransen) A microburst is defined as “a small downburst with its outburst damaging winds extending only 4 km (2.5 miles) or less. In spite of its small horizontal scale, an intense microburst could induce damaging winds as high as 75 m/sec (168 mph). (Caracena)

Historic Occurrences

NOAA data for 1996-2004 indicates 30 thunderstorms (which resulted in three injuries), six microbursts, 69 hail events, 18 high wind events (not associated with a thunderstorm or blizzard), and one lightning event (which resulted in a death) in Big Horn County. The Tornado Project data base lists 10 tornadoes and two funnel clouds in Big Horn County between 1960 and 2004. Seven tornadoes were F1 scale, the others were F0 scale. Selected key events from the period 1996-2004 are included in Table 3.10.

The reservation experiences significant lightning events. Figure 3.4 displays positive (+) and negative (-) lightning strikes between 6:00 p.m. on June 6 and 1:15 a.m on June 7, 2005 There were a total of 2,128 strikes in the shaded area during this seven-hour period.

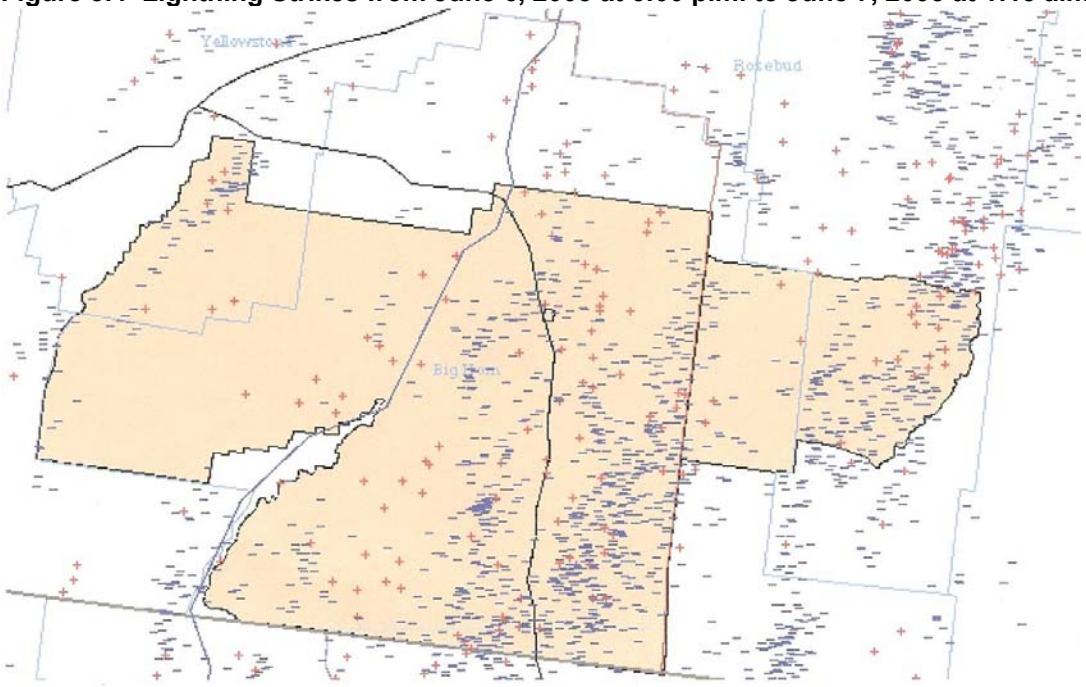
Table 3.10 Major Severe Thunderstorm Events

Date	Event Type	Description
July 1996	Thunderstorm Wind	A wind gust estimated at 80mph damaged a shed roof and two grain bins near Lodge Grass.
July 1998	Hail	Baseball sized hail damaged numerous vehicles and broke windows and yard lights.
July 2000	Microburst	Six different microbursts recorded during this month (in Big Horn County)
July 2003	Thunderstorm Wind	2-4 miles east of Pryor. Unsecured, unoccupied mobile home was thrown off cinder block foundation and tossed 75 yards away and destroyed. Two grain silos destroyed. Damage consistent with straight line winds in excess of 100 mph.
	Winds	Strong winds (possibly a microburst) took out the bleachers in the county fairgrounds. Date unknown—sometime in 2002 or 2003.

Sources: NOAA and meeting with Big Horn county commissioners

Participants at the June PDM steering committee meeting described high winds (also described by participants as tornadoes) that damaged two houses in Apsaalooke Heights in Crow Agency, one trailer house turned over completely. They also described high winds in Benteen (date unspecified—approximated at 2000 or 2001) that took out 5 to 6 miles of power poles and a roof from a building.

Figure 3.4 Lightning Strikes from June 6, 2005 at 6:00 p.m. to June 7, 2005 at 1:15 a.m.



Source: BLM

Vulnerability and Potential Loss Estimate

Thunderstorms, windstorms and related weather events will continue to be a hazard for existing and future development wherever it may be located on the Reservation.

Severe thunderstorms, high winds, tornadoes, and hail have the potential for:

- loss of life and injury
- property damage (complete destruction possible in the case of tornadoes and extreme winds, other damage to roofs, siding, windows, vehicles, equipment, from strong winds, tornadoes, and hail)
- power outages and related effects
- crop damage (particularly from hail)
- livestock fatalities and injuries
- damage to utility infrastructure (power lines, etc.)

SHELDUS data indicates property and crop damage in Big Horn County from severe thunderstorms, hail, lightning and wind events for the period 1960 through 2000 as shown in Table 3.11.

Table 3.11 Damage Summary of Thunderstorm/Wind Events from SHELDUS data

Type	# of Events	Property Damage	Crop Damage
Hail	10	$ 721,414	$ 1,019,141
Tornado	4	154,000	100,000
Severe Thunderstorm (includes events with hail and wind)	10	1,145,444	721,934
Strong Winds (includes thunderstorm and blizzards)	10	1,127,701	424,173

Source: SHELDUS data base

The most property damage from a single event was $500,000 from a hail/thunderstorm event in 1989, and the most costly in terms of crop damage was $500,000 from the same storm event. (SHELDUS)

Based on past events, all areas of the reservation are vulnerable to damage from severe thunderstorms, wind events, hail, lightning, and tornadoes, but damage is typically localized rather than reservation-wide from any one event. There is a high probability for occurrence of thunderstorms, lightning, wind events, and hail and a low-moderate probability for tornadoes and microbursts. Severity of event can vary. Because of the potential to completely destroy major facilities, tornadoes have tremendous potential for economic losses.

DROUGHT/EXTREME HEAT

"Drought is an extended period of below normal precipitation which causes damage to crops and other ground cover; diminishes natural stream flow; depletes soil and subsoil moisture; and because of these effects causes social, environmental, and economic impacts to Montana." (Montana Drought Response Plan, 1995)

Drought and extreme heat (with or without drought) can occur throughout the Crow Indian Reservation.

Historic Occurrences

Legendary drought occurred in eastern Montana in the 1930s. Impacts were severe across not just Montana, but the entire Great Plains and led to changes in farm practices that have lessened the impacts of subsequent droughts, such as the one in the 1950s.

As shown in Figure 3.5, between 1895 and 1995, the area of the Crow Reservation has been in severe or extreme drought 15 to 19.99% of the time. Figure 3.5 is based on the Palmer Drought Severity Index (PDSI), which quantifies drought in terms of moisture demand and moisture supply.

Figure 3.5 Palmer Drought Severity Index

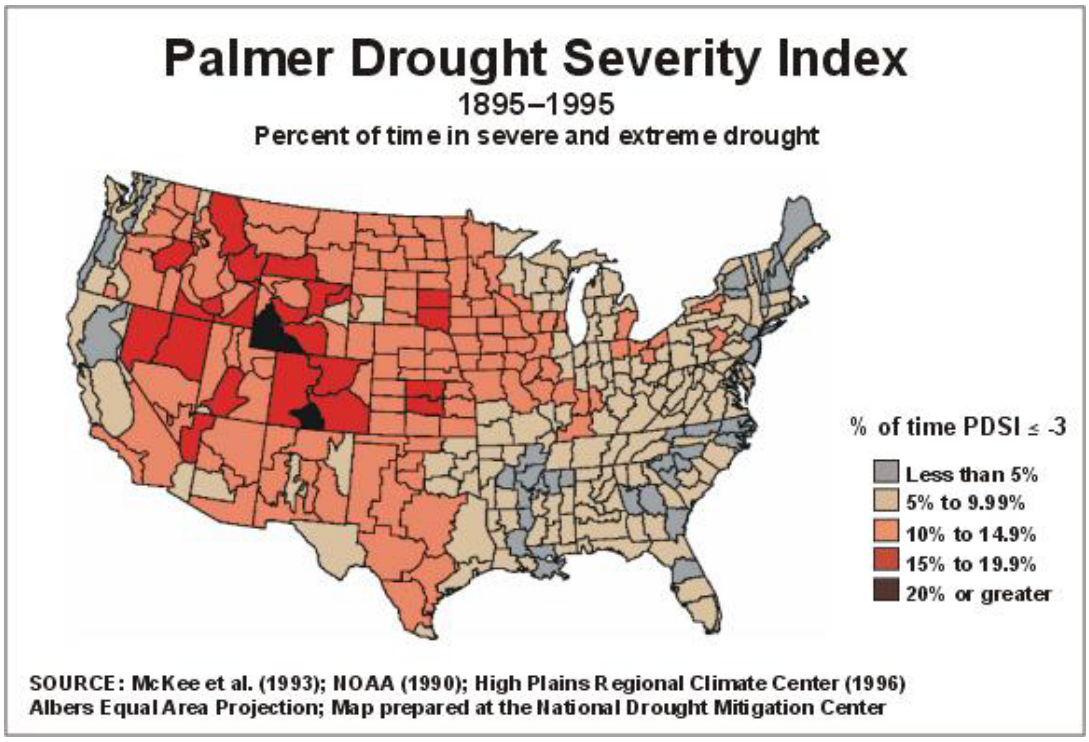


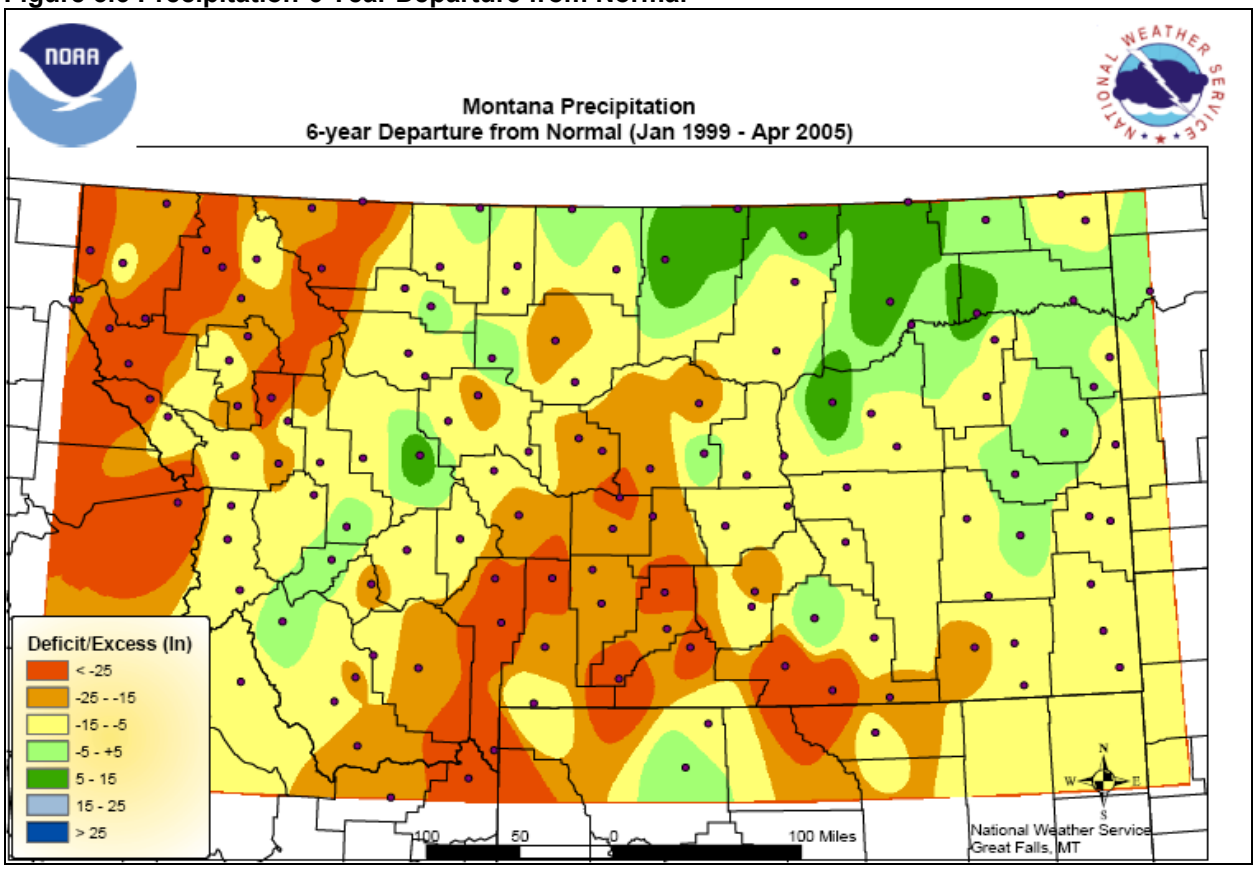
Figure 3.6 shows the 6-year departure from normal precipitation between January 1999 and April 2005. In some areas of the reservation, the cumulative effect over the six years between 1999 and 2005 was the equivalent of a loss of one to two years or more of precipitation.

Drought brings or intensifies other related hazards—reduced water supplies, grasshoppers, plant disease, wind erosion, and wildfires. Table 3.12 lists declarations related to drought (excluding wildfires, which are covered elsewhere in this chapter).

Participants in the PDM planning process were concerned about depletion of water supplies and trade-offs among competing water uses during drought periods. The question was raised, “How do we address needs for farming irrigation, public water supplies, wildlife needs, and in-stream flows needed for fisheries?”

Extreme heat with or without prolonged drought can stress humans, crops, and animals, and was also identified by PDM planning participants as causing power outages. Crow Agency has the Montana state record for longest consecutive period with temperatures 90 degrees or above (38 days between July and September, 1922). (Western Regional Climate Center)

Figure 3.6 Precipitation-6 Year Departure from Normal



Source: NOAA. http://www.wrh.noaa.gov/tfx/pdfs/hydro/mt_1999.pdf

Table 3.12 Drought-related Disaster Declarations

Date	Type	Area Affected	Designation Type
1997	Drought	Big Horn and Rosebud Counties among many in state	USDA
1998	Drought	Big Horn County one of many in state	USDA
1999	Drought and excessive heat	All Montana Counties receive designation	USDA
1999	Drought, early frosts and fire conditions	Rosebud County one of 10 counties receiving this designation	USDA
2000	Grasshoppers	Powder River, Big Horn, Carter, Custer, and Rosebud Counties	USDA
2000	Hail and Grasshoppers	Rosebud, Big Horn, Custer, Garfield, Musselshell, Petroleum, Powder River, Treasure, Yellowstone	USDA
2001	Drought	All Montana Counties	USDA
2002	Drought	All Montana Counties	USDA
2003	Drought	Big Horn and Rosebud Counties among many in state	USDA
2004	Drought	Big Horn County, Carbon, Carter, Powder River Counties and counties in Wyoming	USDA

Source: USDA Disaster Declaration Summary

Vulnerability and Potential Loss Estimates

Based on past history, there is continued probability that drought will occur in the future on the Crow Indian Reservation. Although there may be periods of higher than average precipitation, the Palmer Drought Severity Index long-term trend data indicate that the reservation is in severe or extreme drought up to nearly 20 percent of the time.

Drought produces a complex web of impacts that spans many sectors of the economy. Direct effects of drought include:

- reduced crop, livestock, and rangeland productivity
- increased fire hazard
- reduced water levels and potential for reduced drinking water supply
- damage to wildlife and fish habitat.

Indirect effects include those impacts that ripple out from the direct effect. Indirect effects include reduced business and income for local retailers, increased credit risk for financial institutions, capital shortfalls, loss of tax revenues and reduction in government services, unemployment, and out-migration.

The Montana Governor's Drought Report of May, 2004 referenced the economic and societal effects of drought:

> The state's biggest drought story remains the deepening socio-economic drought. The drought threatens to change the very fabric of Montana's rural communities and landscape. It is the final straw that can bankrupt 4th- and 5th-generation farmers and ranchers, placing the birthright of descendants of pioneer families on the auction block. And like the changing vistas, many of the well-established county agri-businesses are disappearing forever, along with other main street institutions.

There is no standardized method for tracking economic losses related to drought in Montana. Historical data for direct economic effects of drought include the following:

- Continued lack of moisture in 1985 resulted in a state-wide wheat crop that was the smallest in 45 years. For a typical 2500 acre farm/ranch, the operation lost more than $100,000 in equity over the course of that year. (www.state.mt.us/dma/DES/Drought.htm)

- In 2001, the Montana Department of Livestock estimated a decrease in Montana cattle herds of approximately 450,000 head of cattle, or 18%, due to drought. The loss estimate consisted primarily of cattle moved out of state for change of pasture (and includes those that were sold). (Montana Department of Livestock, 2001 and Montana Agricultural Statistics Service)

- In May 2005, the USDA Farm Services Agency approved Emergency Conservation Program (ECP) funding to assist producers with cost-share assistance to provide emergency water in pastures where the previously adequate water source had failed. Big Horn County was among 10 counties that qualified for the program.

- Damage Assessment Reports filed by the Farm Service Agency in Big Horn County in 2004 and 2005 indicated that 84% of all producers were experiencing production losses of 40% or more.

Drought does not directly affect structures and infrastructure in the same dramatic and immediately costly ways that other hazards, such as flooding, can and to which there are existing disaster aid responses, such as through FEMA. The primary effect of drought is on land and water resources. Indirect cost effects, such as reduced business with local merchants, etc.), would be in addition to direct losses to agricultural producers. The combined direct and indirect costs of drought are estimated to be double that of the direct costs alone (Aber, personal communication).

Direct and indirect costs of a drought could be in the millions of dollars. For example, the estimate of losses to hay crops alone in one year in Big Horn County was approximately $3.5 million (Big Horn County 2006). Indirect cost effects, such as reduced business with local merchants, etc.), would be in addition to direct losses to agricultural producers. The combined direct and indirect costs of drought are estimated to be double that of the direct costs alone (Aber, personal communication).

Livestock ranchers and others can experience any number of economic impacts from drought that include:

- Reduced productivity of rangeland.
- Forced reduction of foundation stock
- Reductions of irrigation water
- Cost of supplemental feed and/or cost of moving to other locations with pasture
- High cost/unavailability of water for livestock
- Cost of new or supplemental water resource development (wells, etc.)
- Increased feed transportation costs
- Disruption of reproduction cycles (delayed breeding, more miscarriages, etc.)
- Decreased stock rates
- Range fires
- Reduced groundwater well yields

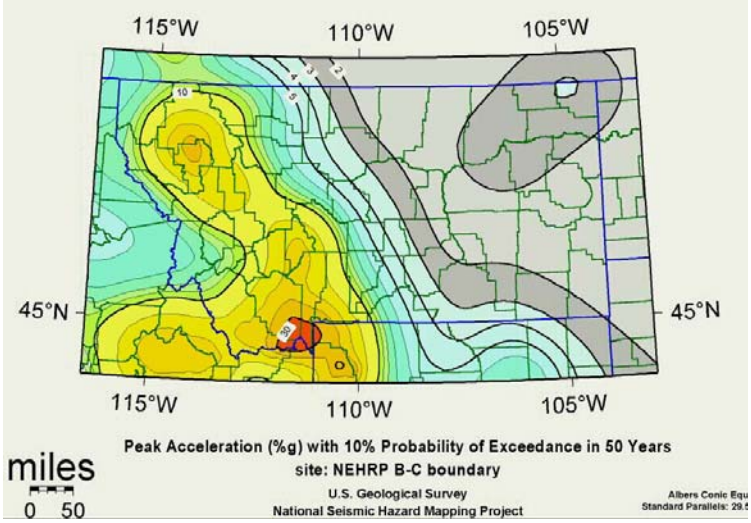
In summary, there is a high potential for drought occurrence on the Crow Indian Reservation with accompanying high economic losses in the millions of dollars annually. There is no specific mapped hazard area, instead the entire reservation is essentially vulnerable to drought. There is also a high potential for occurrence of extreme heat, with moderate to high severity of impacts.

EARTHQUAKES

An earthquake is "a sudden motion or trembling that is caused by a release of strain accumulated within or along the edge of Earth's tectonic plates. Common effects of earthquakes are ground motion and shaking, surface fault ruptures, and ground failure." (FEMA: Understanding Your Risks)

The FEMA guidebook "Understanding Your Risks: Identifying Hazards and Estimating Losses" recommends that if there is an area of 3% g peak acceleration or more then the hazard should be profiled more closely. Earthquake severity is often expressed as a comparison to the normal acceleration due to gravity and is expressed as "g" force. A 100% g earthquake is very severe. Peak acceleration values on the Crow Indian Reservation range from 3% (dark grey) to about 5% (light blue).

Figure 3.7 Peak Acceleration Values in Montana.



Source: Montana Multi-Hazard Mitigation Plan

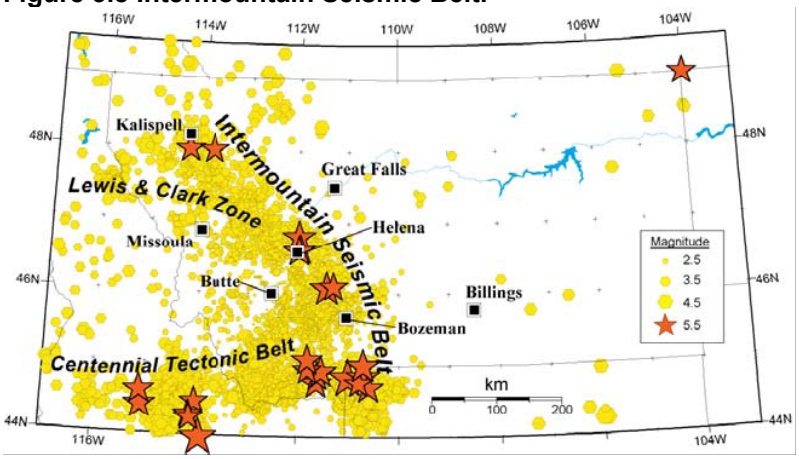
Historic Occurrences

The most seismically active portion of the state is in southwestern Montana as shown in Figure 3.7 and Figure 3.8. (State of Montana Multi-Hazard Mitigation Plan)

There were 27 earthquakes in Big Horn County and the surrounding counties between 1943 and 2004. The magnitude ranged from 1.9 to 4.3 on Modified Mercalli Scale. (Stickney)

There are no quarternary faults on the Crow Reservation, although many exist to the west and south (USGS, Quarternary Fault and Fold database).

Figure 3.8 Intermountain Seismic Belt.



Source: Montana Multi-Hazard Mitigation Plan

Vulnerability and Potential Loss Estimate

Earthquakes will continue to occur in Montana, however the precise time, location, and magnitude of future events cannot be predicted.

The Montana Multi-Hazard Mitigation Plan identified earthquake losses for the 10 Montana counties with the highest potential for earthquake damage. All of these counties were in the western portion of the state. Annualized loss estimates ranged from $225,000 in Madison County to $2.3 million in Gallatin County. Estimates were made using the HAZUS (beta v 28.b) Earthquake model developed by the Federal Emergency Management Agency (FEMA).

The Montana Multi-Hazard Mitigation Plan identified Big Horn County's potential for an earthquake to have less probability of occurring than in Madison County. Therefore, the annualized loss estimate for the Crow Reservation as a result of an earthquake would be less than $225,000. (State of Montana Multi-Hazard Mitigation Plan)

Based on past incidents on the Reservation, there is potential for smaller earthquakes to occur on or near the Reservation, but the potential for a high severity impact earthquake is low.

VOLCANIC ERUPTIONS

The state of Montana is within a region with potential for volcanic activity. The two volcanic centers affecting Montana in recent geologic time are: 1) the Cascade Range of Washington, Oregon and California; and 2) the Yellowstone Caldera in Wyoming and eastern Idaho.

Volcanic eruptions are generally not a major concern in Montana due to the relatively low probability (compared with other hazards) of events in any given year. Volcanic eruptions in the Cascade Mountains are more likely to impact Montana than Yellowstone eruptions, based on the historic trends of past eruptions. (Montana Multi-Hazard Mitigation Plan)

The primary effect of the Cascade volcanic eruptions on Montana would be ashfall. According to the Montana Multi-Hazard Mitigation Plan, ashfall can create significant damage including:

- Short-circuiting and causing failure of electronic components, especially high-voltage circuits and transformers
- Interrupting or preventing radio and telephone and radio communication
- Damage to air filters and affecting internal combustion engines
- Making roads, highways, and airport runways slippery and treacherous
- Reducing visibility to near 0
- Causing crop damage depending on the thickness of ash, type and maturity of plants, and timing of subsequent rainfall.
- Posing health risks, especially to children, the elderly, and people with cardiac or respiratory conditions

Historic Occurrences

The Mount St. Helen eruption in the state of Washington is the most recent volcanic event that has significantly affected Montana. After the eruption of Mount St. Helen in May 1980, a coating of up to 5.0 mm (0.2 inches) of ash fell on Western Montana. Ash deposits were thickest in the western portions of the state, tapering to near zero on the eastern part of the state. (Montana Multi-Hazard Mitigation Plan)

Participants in the Crow PDM planning process indicated that schools on the reservation shut down because of ashfall and air pollution when Mount St. Helen volcano erupted in 1980 in Washington.

Vulnerability and Potential Loss Estimate

The Montana Multi-Hazard Mitigation Plan assesses vulnerability as follows:

> Due to the numerous variables involved, it is difficult to assess the vulnerability of the State of Montana to a volcanic eruption. The primary hazard to which the State may be vulnerable at some future time, is ashfall from a Cascade volcano. The effect would depend on the interaction of such variables as source location, frequency, magnitude and duration of eruptions, the nature of the ejected material and the weather conditions. Therefore, the entire state may be considered vulnerable to ashfall to some degree in the event of a volcanic eruption.
>
> Although the probability is minimal, there is the potential for a catastrophic eruption in the vicinity of Yellowstone National Park that would have very serious consequences for Montana and neighboring states. Again, assessing the vulnerability of the State to such an event is impossible due to the numerous variables and uncertainties that must be considered.

The Summer 2005 edition of *Yellowstone* Science discussed advance notice for a volcanic eruption:

> The science of forecasting a volcanic eruption has significantly advanced over the past 25 years. Most scientists believe that the build-up preceding a catastrophic eruption would be detectable for weeks, and perhaps months to years.

They added that for the most likely type of volcanic eruption in Yellowstone, “everywhere would be safe except in the immediate vicinity of the advancing lava flow.”

Based on existing information, the probability of a volcanic event is low and potential impacts could be moderate to catastrophic. Costs of a major ashfall event could be in the millions. It is estimated that the ashfall cost Missoula County nearly $6 million in cleanup and lost work time. The statewide cost has been estimated at between $15 and $20 million**.** (Montana Multi-Hazard Mitigation Plan)

LANDSLIDES

The Crow Indian Reservation includes areas with potential for landslides. The term landslide, as used in the Montana Multi-Hazard Mitigation Plan, includes "all types of gravity-caused mass movements of earth material, ranging from rock falls, slumps, rock slides, mud slides, and debris flows." (Montana Multi-Hazard Mitigation Plan)

Earth movement most commonly occurs as the almost imperceptible slow creep of soil down gentle slopes, but it also can occur as catastrophic landslides. Landslides can damage and destroy homes, farm/ranch and commercial/industrial facilities, roads, railroads, pipelines, electrical and telephone lines, mines, oil wells, sewers, bridges, and dams. In landslide-prone areas, anything affecting slope conditions such as seismic activity or increased soil moisture may cause movement or may reactivate prior movement. (Montana Multi-Hazard Mitigation Plan)

The USGS indicates low to moderate incidence of landslides for the Reservation. Certain areas of the reservation, as shown in Figure 3.9, have a moderate to high susceptibility for landslides. The highest susceptibility is along the Big Horn Mountains, an area from the Wyoming border to St. Xavier that includes Rotten Grass Creek. Areas of slumping are visible in this area and landslides have been known to occur. The area includes scattered rural residences and the Yellowtail Reservoir. No damage reports were identified in any technical reports, existing plans, or from public comment.

Historic Occurrences

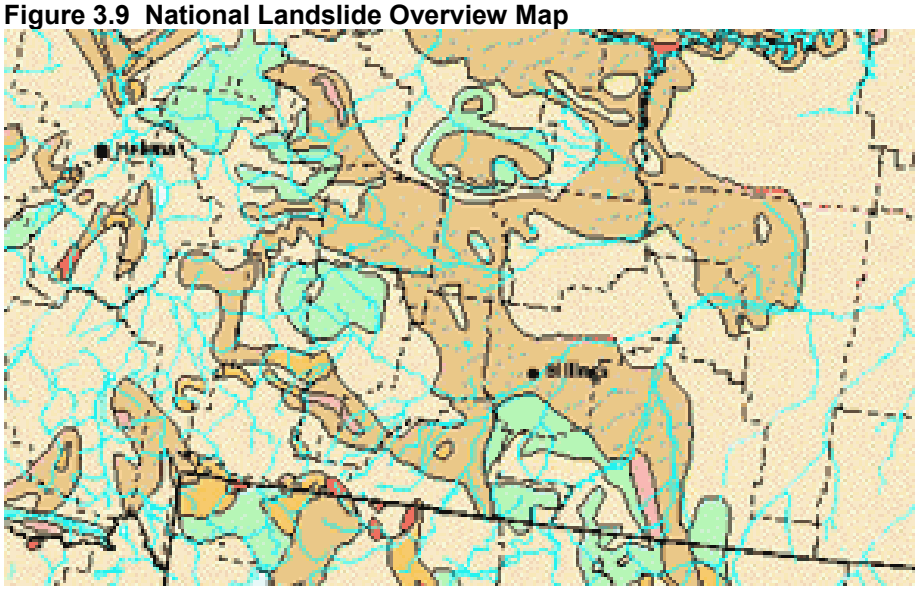
Areas of landslides or earth slumping are visible along the eastern slopes of the Big Horn Mountains between St. Xavier and the Wyoming border. The exact number is unknown.

Vulnerability and Potential Loss Estimate

There is no statewide or national inventory of landslides, but nationwide, landslides are estimated to result in annual losses of approximately 25-50 lives and $1-2 billion annually (Montana Multi-Hazard Mitigation Plan). The largest landslide in the history of Montana was caused by the 1959 Hebgen Lake Earthquake. Nearly 1.25 miles of the Madison River and Highway 287 were buried to depths as great as 394 feet. In May 2005, mudslides damaged 13 sections of the Beartooth Highway in Carbon County, resulting in $20.4 million in repairs (Billings Gazette, July 30, 2005). Indirect costs to the businesses in Red Lodge, Cooke City and Silver Gate that rely on summer tourist dollars have not been calculated but the tourism industry was reported to have been seriously affected (particularly in Cooke City and Silver Gate). (Various articles in Billings Gazette, summer 2005)

The area on the Crow Reservation with highest susceptibility is also identified as having a moderate incidence level. This area is rural and does not include any communities (St. Xavier is located in the flat area of the Big Horn River Valley). Roads in the area (BIA and county roads) would also be at risk and repairs could be in the hundreds of thousands of dollars or more based on the extent of damage.

Figure 3.9 National Landslide Overview Map



Source: USGS

National Map Legends

Landslide Incidence

- Low (less than 1.5% of area involved)
- Moderate (1.5%-15% of area involved)
- High (greater than 15% of area involved)

Landslide Susceptibility/Incidence

- Moderate susceptibility/low incidence
- High susceptibility/low incidence
- High susceptibility/moderate incidence

Susceptibility not indicated where same or lower than incidence. Susceptibility to landsliding was defined as the probable degree of response of [the areal] rocks and soils to natural or artificial cutting or loading of slopes, or to anomalously high precipitation. High, moderate, and low susceptibility are delimited by the same percentages used in classifying the incidence of landsliding. Some generalization was necessary at this scale, and several small areas of high incidence and susceptibility were slightly exaggerated.

There is also some potential for a landslide to generate a seiche in Big Horn Lake. This issue was raised by participants in the Crow PDM planning sessions. A seiche is a standing wave in an enclosed or partially enclosed body of water. As defined by the U.S. Army Corps of Engineers:

> If the surface of an enclosed body of water such as a harbor or bay is disturbed, long waves may be generated that will rhythmically slosh back and forth as they reflect off the opposite ends of the basin. These waves, called seiches, will travel back and forth until the energy is lost to frictional forces. The period of a seiche is dependent upon the size and depth of the basin in which it occurs. (http://www.usace.army.mil/publications/eng-manuals/em1110-2-1607/c-2.pdf)

EPIDEMICS

Participants identified epidemics or disease as a potential disaster that could occur anywhere on the reservation. The following discusses some current potential epidemics of concern.

West Nile Virus

West Nile Virus can cause serious illness and death in humans, horses, and birds. The following was extracted from the Montana Department of Health and Human Services website:

> West Nile virus is carried primarily by birds but can be transmitted by mosquitoes to humans, horses, and some other animals. The first documented case in the United States occurred in New York in 1999, and the disease has since spread westward into nearly every state. Only Alaska, Hawaii, and Washington have so far been virus-free, according to the U.S. Centers for Disease Control and Prevention (CDC).
>
> Montana's first confirmed case of West Nile virus involved a horse in Shepherd in late August 2002.

Pandemic Influenza

Pandemic influenza is a global outbreak of disease that occurs when a new influenza A virus appears in humans, causes serious illness, and then spreads easily from person to person worldwide because we have no built-up immunity to it. Influenza A viruses are found in many different animals and include avian or bird flu. (Montana Department of Public Health and Human Resources)

Water-Borne Illnesses

Numerous types of water-borne illnesses include e. coli bacteria, salmonella, giardia, norovirus, and other Norwalk-like viruses. Water-borne viruses and bacteria can cause symptoms of nausea, vomiting, and diarrhea. (Mosher)

Diseases Affecting Livestock and Wildlife

A number of diseases can affect livestock and wildlife. The Montana Department of Livestock identifies a number of potential diseases for livestock including:

- Anthrax - history of cases in Montana
- Rabies - history of cases in Montana
- Vesticular Stomatitis (history of cases in Montana)
- Bovine Spongiform Encephalopathy (Mad Cow Disease) -- no reported cases in Montana
- Foot and Mouth Disease – no records of disease in Montana records back to 1907

Chronic wasting disease is a fatal disease of the central nervous system of captive and free-ranging mule deer, white-tailed deer, and Rocky Mountain elk.

Historic Occurrences

West Nile Virus

Since 2003, there have been 11 cases in humans in Big Horn County. (Montana Department of Public Health and Human Resources)

Pandemic Influenza

Since the beginning of the 20th century, there have been three pandemic flu outbreaks in the United States. The following is excerpted from the Montana Department of Public Health and Human Resources website:

- **1918 Spanish flu:** More than 20 million people died worldwide, an estimated 500,000 in the United States. Contagion was exacerbated by troop movements at the end of World War I.

- **1957 Asian flu:** Responsible for about 69,800 deaths in the United States . Unlike the 1918 virus, this pandemic virus was quickly identified due to advances in scientific technology, allowing for fast production of vaccine.

- **1968 Hong Kong flu:** Responsible for about 33,800 deaths in the United States . This was the mildest true pandemic of the 20th century. The lower death rate might have been due to immunity to a related flu strain and/or to the fact that the pandemic was at its peak during the Christmas holiday, when schoolchildren were home.

Diseases Affecting Livestock and Wildlife

There were two cases of anthrax diagnosed in cattle in Montana in the summer of 1999, one in May and one in August. The two incidents were unrelated, having occurred far apart from each other in isolated parts of eastern Montana. Both cases were contained early and led to no additional problems. Prior to 1999, the last case of naturally occurring anthrax in Montana was reported in 1985. The organism naturally occurs in the soil in many parts of Montana, as well as other states.

Over 60 cases of rabies are diagnosed annually in Montana, with most cases occurring in skunks and bats.

In 2005, horses were found positive for vesticular stomatitis in Big Horn and Rosebud Counties, as well as other locations in Montana. Premises with the infected horses were quarantined. By November 2005, quarantines were released on all locations.

There have been no reported cases of Mad Cow Disease in Montana.

There have been no cases of Chronic Wasting Disease in Montana's wild deer and elk populations (Montana Department of Fish, Wildlife and Parks).

Vulnerability and Potential Loss Estimate

The Crow Indian Reservation is vulnerable to a number of insect-borne and other diseases that can affect animals and humans. Potential direct losses can include:

- human sickness and death
- sickness and death in domestic and wild animals

In a pandemic, the federal government has indicated that the most effective and fast responses will come locally, not at the federal level. Responses will come from local medical providers, such as the IHS hospital and clinics.

Generally, there are any number of insects, pests, and diseases that could harm humans, livestock, crops, and the economy of the Crow Indian Reservation. Information and assistance on these issues through a number of sources including the Agricultural Extension, Montana Departments of Health and Human Services, Agriculture, and Livestock), and federal programs.

Based on past history, probability of a major epidemic is low and risk severity is high due to the potential for many deaths.

ACTS OF TERRORISM

An act of terror, or terrorism, was identified at the PDM planning meetings as a potential hazard of concern.

Historic Occurrences

There have been no terrorism acts on the Crow Reservation.

Vulnerability and Potential Loss Estimate

With critical facilities, large annual events (such as Crow Fair), major dams, and utility, transportation, and pipeline corridors, the Crow Reservation has some vulnerability for acts of terrorism. The Crow Reservation has a Homeland Security Strategy for Weapons of Mass Destruction Terrorism Events.

Participants indicated low potential for a terrorism incident on the Reservation, with potentially high severity of impacts.

ASSETS AND VULNERABLE POPULATIONS

This section provides more information on physical, social, and economic assets on the Crow Indian Reservation that might be affected by a hazard. Information on assets includes types and numbers of various buildings and infrastructure and estimates of replacement costs where available.

The information in this section was used to identify potential costs of specific hazards. Any of the hazards could occur almost anywhere on the reservation. The information in this section is intended to provide a general guide for estimating cost of damages from potential hazards.

Disasters could affect **critical facilities**, facilities essential to health and welfare. Critical facilities include medical facilities, transportation systems, utility systems (such as potable water and wastewater distribution systems), and high potential loss facilities.

Social assets include **vulnerable populations**, people who may be at special risk for a hazard. Identifying these populations assists in providing emergency assistance if and when it may be needed during a disaster.

Assets and Critical Facilities

The following table identifies key assets on the Crow Indian Reservation and their estimated replacement value in the event of a complete loss. The table is intended to provide an initial yardstick measurement of loss because actual damages could range from relatively minor damage to complete destruction, and interruption of service or business. Costs of providing services in temporary locations and loss of business revenue would be additional to the replacement costs.

Indian Health Services Hospital in Crow Agency

Table 3.13 Assets and Critical Facilities

Name or Description of Asset	Critical Facility	Vulnerable Population	Economic Assets	Special Considerations	Historic/Other Consideration	Replacement Value	# of Facilities/Units	Other
Crow Agency								
Residential			x	x		$27,600/unit	361	per 2000 census
Commercial	x		x			$67-$88/ square foot	10-15	gas stations, hotel, casino, gift shops, laundermat, mercantile, RV Camp, restaurants; replacement value based on FEMA "Understanding Your Risks" page 3-10
Churches	x		x	x		$113/square foot	5-6	replacement value based on FEMA "Understanding Your Risks" page 3-10
Crow Agency Elementary School	x	x	x			$5,282,000	1	
Little Big Horn College	x	x	x			$115/square foot	1	no estimate received from the college; replacement value based on FEMA "Understanding Your Risks" page 3-10
Crow Tribal Facilities	x	x	x			$88-$225 /square foot	Multiple buildings	no estimate received; includes government buildings, senior center, headstart
U.S. Post Office	x		x				1	
BIA Offices	x		x			$19.1 million	Various	Includes water and waste water system, law enforcement building; estimate from Bruce Ward BIA Rocky Mountain Region Facility Manager
Little Big Horn Battlefield National Monument	x		x		x	$131/square foot	1	No estimate received from Park Service, replacement value based on FEMA "Understanding Your Risks" page 3-10
Awekualawaache Care Center	x	x	x			$225/square foot	1	No estimate received- based on $225/square foot estimate of hospital cost replacement from IHS
IHS Hospital	x	X	x			$21.2 million	1	Estimate of $225/square foot from Gary Carter, IHS, Billings
Dunmore								
Residential			x	x		$61,400/unit	<50	Per unit value based on the county-wide 2000 census median housing value
Church	x		x	x		$113/square foot	1	replacement value based on FEMA "Understanding Your Risks" page 3-10

Name or Description of Asset	Critical Facility	Vulnerable Population	Economic Assets	Special Considerations	Historic/Other Consideration	Replacement Value	# of Facilities/Units	Other
Fort Smith								
Residential			x	x		$61,400 and up per unit	143	median price of housing in county is $61,400; note however that this area includes several high end homes along river (est. $350,000 or more)
Fort Smith Public School	x	x	x			$2,781,000	1	K-5 facility; estimate from clerk
Public Water and wastewater systems	x		x			$500,000 to $1 million up-each facility	Separate systems—for town and govt housing	Based on estimates from DEQ and from McKee Engineering
U.S. Post Office	x		x				1	
Garryowen								
Residential			x	x		$61,400/unit	<25	Per unit value based on the county-wide 2000 census median housing value
Commercial	x		x			$67-$88/ square foot	1-2	Conoco-restaurant- trading post-museum; replacement value based on FEMA "Understanding Your Risks" page 3-10
U.S. Post Office	x		x				1	
Reno-Benteen Battlefield Memorial	x		x		x	$131/square foot	1	No estimate received from Park Service, replacement value based on FEMA "Understanding Your Risks" page 3-10
Lodge Grass								
Residential			x	x		$41,800/unit	164	2000 census
Commercial	x		x			$660,750	<12	per assessed value, includes a grocery store in town limits, gas station (outside of town limits)
Telecommunicaitons and electric	x		x			$32,473		per assessed value
Railroad	x		x			$267,998		per assessed value
Churches	x		x	x		$113 per square foot	3-4	Replacement value based on FEMA "Understanding Your Risks" page 3-10
County Facilities	x		x			$189,950		insured replacement value for shop, senior center, sheds
Lodge Grass Town								
Town Hall	x		x			$610,000		Estimated insured replacement value
Water storage tank	x		x			$150,000		Estimated insured replacement value
Sewage lagoon/building	x		x			$100,000		Estimated insured replacement value

Name or Description of Asset	Critical Facility	Vulnerable Population	Economic Assets	Special Considerations	Historic/Other Consideration	Replacement Value	# of Facilities/Units	Other
Other facilities	x		x			$188,400	various	Estimated insured replacement values (includes equipment)
Public School	x	x	x			$8.7million		insured replacement value
IHS Clinic	x	x	x			$225/square foot	1	on border of town limits; estimate based on $225 square foot replacement cost of IHS Hospital in Crow Agency
Head Start Building	x	x	x			$91/square foot	1	on border of town limits Replacement value based on FEMA "Understanding Your Risks" page 3-10
U.S. Post Office	x		x				1	
Lodge Grass area								
Willow Creek Dams	x		x	x			2	No estimate received
Pryor								
Residential			x	x		$55,000/unit	195	2000 census
Commercial	x		x			$67-$88/ square foot	1-2	gas station, restaurant Replacement value based on FEMA "Understanding Your Risks" page 3-10
IHS Clinic	x	x	x			$225/square foot	1	estimate based on $225 square foot replacement cost of IHS Hospital in Crow Agency
Churches	x		x	x		$113 per square foot	1-2	Replacement value based on FEMA "Understanding Your Risks" page 3-10
Public School(s)	x	x	x			$6,377,000	1	one elementary; one high school; insured replacement value
St. Charles Mission Elementary	x	x	x			$91/square foot	1	No estimate received; Replacement value based on FEMA "Understanding Your Risks" page 3-10
Chief Plenty Coups State Park	x		x		x	$1.8 million	1	State Parks Regional Office in Billings, Doug Haberman
U.S. Post Office	x		x				1	
Public Water and Wastewater System	x		x			$815,000-$1.5 million	1	Comparable in size to Busby, estimate based on Busby' estimates

Name or Description of Asset	Critical Facility	Vulnerable Population	Economic Assets	Special Considerations	Historic/Other Consideration	Replacement Value	# of Facilities/Units	Other
St. Xavier								
Residential			x	x		$61,400 and up	<100	median price in county is $61,400; note however that this area includes several high end homes along river (est. $350,000 or more)
Pretty Eagle School	x	x	x			$91/square foot	1	private school-no estimate received; Replacement value based on FEMA "Understanding Your Risks" page 3-10
U.S. Post Office	x		x				1	
Wyola								
Residential			x	x		$23,300/unit	55	2000 census
Wyola Public School	x	x	x			$91/square foot	1	no estimate received; Replacement value based on FEMA "Understanding Your Risks" page 3-10
Public Water and Wastewater	x		x			$500,000 to $1 million up-each facility		Based on estimates from DEQ and from McKee Engineering
U.S. Post Office	x		x				1	
Other								
Communication Facilities-Towers, etc	x		x					
Appsalooke Coal Mine	x		x					
Roads	x		X					
Historic and Cultural Sites	X			X	X			

Vulnerable Populations

The following were identified as populations that may require special care or assistance during or after a disaster or who may be at particular risk to a disaster.

- People in need of medical care. There are several medical facilities on the Crow Indian Reservation. In addition, there are a number of people who have special medical needs who are not hospitalized, but live in their homes on the reservation. According to the 2000 census, 30% of the population between 21 to 64 years of age had some disability, and 57% of the population 65 years or older had a disability.

- Seniors and Elderly. According to the 2000 census, 8.5% of the population was 62 years of age or older.

- Children. There are schools in Crow Agency, Pryor, Wyola, Lodge Grass, Fort Smith, and St. Xavier. According to the 2000 census, 38% of the population was less than 18 years of age.

Song Bird Crow Child Care Center in Crow Agency

- People living in the floodplains. The areas with the densest concentrations of population on the Reservation are along the Big Horn River, Little Big Horn River, and Pryor Creek.

- Isolated rural populations. There are scattered rural residences throughout the Reservation which can be difficult to reach in bad weather. Approximately 12% of the population does not have telephone service (per the 2000 census). Even the established communities can feel somewhat isolated—for example, it takes more than an hour to travel to Pryor from the tribal headquarters in Crow Agency.

- Large events such as Crow Fair and the Little Big Horn Battle Re-enactment. Crow Fair has been noted to have 15,000 participants at any one time. Getting emergency services (such as fire suppression) and evacuation (in the event of high winds, hail, or other damaging weather) was noted by steering committee participants to be a challenge, not yet totally addressed by existing plans.

SUMMARY

Table 3.14 provides an overall summary description of the reservation's vulnerability to each identified hazard. Table 3.14 also includes a brief summary of the potential impacts described in more detail elsewhere in this chapter.

The incorporated jurisdiction of Lodge Grass has essentially the same risk as elsewhere on the Reservation for most hazards.

Lodge Grass has unique risk factors and concerns related to emergency/disaster response as noted below:

- Storm Drainage/Flooding. This was raised as a significant issue at the meetings with the Lodge Grass town council and also in steering committee meetings for the development of the Crow Indian PDM plan. Lodge Grass is subject to flooding from natural events (e.g., storms, rapid snow melt, and ice jams), and from problems with beaver dams and downed timber along Lodge Grass Creek. In addition, the Willow Creek dams are upstream of Lodge Grass. Much of the town lies in the 100-year flood plain of Lodge Grass Creek and flooding is a regular occurrence. Exacerbating the problem is a poor storm drainage system that has drains that are subject to clogging, and outfall lines with insufficient slope.

Storm drain on highway through Lodge Grass

- Power Outages. This was also raised as an issue at the town council meeting. The problem is that the town has no back-up power, and among other things, the town's water and wastewater systems require power to function.

- Fire Fuels Management. This was identified as a major issue. Issues include limited water supply, vacant abandoned buildings, and weeds and other unmanaged vegetative growth throughout the town.

- Emergency Responders. There is concern about the adequacy of emergency response. Although Lodge Grass has its own fire department, it is getting harder and harder to find volunteers. The ambulance crew is only in Lodge Grass in the evenings (6 p.m. to 6 a.m.)

- Technical Assistance. The town has a very limited tax base and few staff. They need technical assistance in a number of areas related to basic services.

- Evacuation Shelter/Safe Place. There is no designated evacuation shelter or other designated “safe place” in Lodge Grass.

- City Park in proximity to Railroad Tracks. The railroad tracks form the eastern boundary of the city park and town officials are concerned about safety because there is no fence separating the tracks from there park.

- Loose animals in town. Town residents are concerned about safety from horses and dogs that run loose through town.

- Damage from downed trees from high winds/ice storms. Town officials are concerned about the number and size of trees in town that could cause damage during high winds and ice or heavy snow storms.

Table 3.14 Summary of Hazards on the Crow Indian Reservation

Hazard	Geographic Area	History of Previous Occurrence	Risk Severity	Probability of Future Occurrence	Existing Structures at Risk	Future Structures at Risk	Potential Loss Estimate
Winter Storm	Reservation-wide	Yes	Moderate-High	High	Biggest single cost expense structure is downed power lines ; could be some structure damage to buildings	Risk to any new structures about the same as for existing	Direct structure costs could be $800,000 or more per event, plus additional losses from livestock/crop loss and stress; business interruption, etc. Potential for loss of life or injury.
Power Outages	Reservation-wide	Yes	Moderate-High-extended power outages could result in human and economic loss—few critical facilities have back-up power	High	Structures not likely at risk generally. More likely results--frozen waterlines, appliance damage , etc.	Risks same as for existing structures	Potential for loss of life/injury. Economic costs could be in the hundreds of thousands of dollars or more per incident, based on national figures.
Wildland Fire	Reservation-wide	Yes	High	High	Structures are at risk throughout the county.	The wildfire priority areas with greatest potential for future residential development are along river bottoms, especially the Big Horn River.	Costs of fire suppression can be several million dollars per incident; in addition costs of losses could be millions of dollars
Hazardous Materials	Primarily along transportation routes (including pipelines) and storage areas	Yes	High	High	Greatest potential structural damage is from explosion; structures at risk are those in proximity to hazardous material sources and transportation routes	Building close to transportation routes is a continuing phenomenon, but development rates are slow on the Reservation compared to other locations in Montana.	Based on experience in other locations in Montana, economic losses could be $6 million or more in direct losses, plus additional costs for business interruption and loss, etc. Potential for loss of life/injury

Hazard	Geographic Area	History of Previous Occurrence	Risk Severity	Probability of Future Occurrence	Existing Structures at Risk	Future Structures at Risk	Potential Loss Estimate
Flood-Flash Flood, Ice Jams	Along waterways and coulees, and in developed areas with poor storm drainage systems	Yes	High	Moderate	Lack of FEMA FIRM maps limit ability to identify specific structures on a reservation-wide basis (see section on Flooding for more detail)	More residential development is expected along the rivers in the future	A single occurrence, such as the flood of 1978, could result in direct damages in the $ tens of million or higher, with additional costs associated with interruption of business, etc. Potential for loss of life/injury.
Flood from Dam Failure	Five high hazard dams on the Reservation	No recorded history of dam failure	High	Low	High hazard dam downstream areas include all communities along the Big Horn River (Yellowtail Dam), Lodge Grass (Willow Creek)	More residential development is expected along the rivers in the future	Catastrophic cost in the worst case scenario of Yellowtail Dam failure: Total destruction of communities, loss of life, cost of displacement and rebuilding far downstream of Big Horn County
Loss of Emergency Communications	Throughout Reservation	Yes	Moderate - High	Moderate	NA	NA	Loss of emergency communication could result in human injury and death
Winter Cold	Reservation-wide	Yes	Moderate - High	Moderate	Could happen anywhere—all structures potentially at risk	Same as for existing	• Power outages • Loss of life/illness/injury humans and livestock • Insufficient heat could cause pipe damage and structural damage (e.g., water from broken pipes)
High Wind, Microburst, Tornado	Reservation-wide	Yes	Moderate-High	High for high wind Low-moderate for microburst and tornado	Could happen anywhere—all structures potentially at risk	Same as for existing	• Losses of hundreds of thousands of dollars per incident possible • Loss of life /injury humans and livestock • Structure damage

Hazard	Geographic Area	History of Previous Occurrence	Risk Severity	Probability of Future Occurrence	Existing Structures at Risk	Future Structures at Risk	Potential Loss Estimate
Train Accident – DeRailment	Rail-lines	Yes	Moderate-High	Moderate	Very few buildings built right next to tracks	Railroad easement precludes much development right next to tracks	Single most costly accident in Big Horn County was in 1998--$1.08 million damage to railroad facilities and equipment
Acts of Terrorism	Various facilities and events throughout the Reservation	No	High	Low	Existing structures could be at risk	New structures could be at risk	Costs could be in millions of dollars and human loss and injury
Lightning	Reservation-wide	Yes	Moderate	High	Structures at risk from fire caused by lightning	New structures would have same risk as existing	Losses from a single lightning strike could be loss of human life or injury Major structural losses associated with lightning typically associated with lightning-caused wildfire
Drought	Reservation-wide	Yes	High	High	0 from direct effects	0	As high as $10m or more annually for direct losses to crops and livestock production. Potential for loss of life/injury from prolonged heat.
Hail	Reservation-wide	Yes	High	Moderate-High	Could happen anywhere—all structures potentially at risk	Same as for existing	• Losses of hundreds of thousands of dollars per incident possible • Power outages • Loss of life/illness/injury humans and livestock • Structure damage
Extreme Heat	Reservation-wide	Yes	Moderate-High	High	0	0	• Loss of life/illness to humans and animals • Livestock losses would contribute to increased economic losses • Potential crop losses

Hazard	Geographic Area	History of Previous Occurrence	Risk Severity	Probability of Future Occurrence	Existing Structures at Risk	Future Structures at Risk	Potential Loss Estimate
Volcanoes	Reservation at risk from ashfall; no volcanoes on the reservation or within a several hundred mile area	Yes- some Ashfall from the 1980 eruption of Mt.St. Helen	Moderate-High	Low	Could happen anywhere—all structures potentially at risk	Same as for existing	Costs for dealing with ashfall could be $6 million or more based on experience in Missoula County. A catastrophic event in Yellowstone National Park would have extremely severe consequences on the Reservation
Earthquake	No identified faults on the Reservation	Yes-low severity	Moderate	Low (for a high severity impact earthquake)	Structures could suffer some damage	New structures not at any greater risk than existing structures	<$225,000 benchmarking against counties with higher probability of occurrence
Landslides	highest along slopes of Big Horn Mountains	Yes - visible evidence of slumping and earth movement	Moderate	Moderate Incidence Rating per USGS	For area of greatest risk, estimated at less than 2% of all structures in county; some roads at risk	Not an area with recent or projected development growth activity	Losses could include structural damage or loss to structures, roads, and other infrastructure, and potential for loss of life/injury. Dollar costs could be in the $hundreds of thousands or more.
Seiche	At Yellowtail Reservoir	Undocumented	Moderate-High	Low	Marinas could be at risk	No new marinas planned	Could result in destruction to marinas, boats, and potential loss of human life and injury
Epidemics	Reservation-wide	Yes (as part of other larger documented cases—e.g., 1918 flu epidemic)	High	Low	NA	NA	A major epidemic could result in many deaths

Probability of Occurrence Rating:

Low = 0-1 major incidents in a 5-year period
Moderate = 2-9 incidents in a 5-year period
High = 10 or more incidents in a 5-year period, or prolonged ongoing (e.g., drought lasting several years)

Risk Severity Rating:

Low = no serious injury or loss of human life, damage is less than $500,000.
Moderate = Loss of human life and/or damage between $500,000 and $3 million.
High = Multiple lives lost and/or damage greater than $3 million.

CHAPTER 4: MITIGATION STRATEGY

This chapter identifies the "blueprint" for reducing losses associated with the hazards described in Chapter 3.

This chapter includes:

- a short description of the **methodology** used to develop the mitigation strategy, which is also discussed to some extent in Chapter 2;
- the **Goals and Mitigation Actions**
- **Project Ranking and Prioritization** and
- **Implementation** and administration of the plan

METHODOLOGY

The contractor developed initial goal statements and a preliminary list of projects from information discussed at the second steering committee meeting/public meeting held on August 1. The contractor reviewed each identified hazard with participants at the meeting to ensure that all hazards were considered for mitigation measures.

On September 6, participants at the meeting reviewed and revised the initial goal statements and project/mitigation measures.

Participants reviewed a range of mitigation actions that included data collection, ways to improve public awareness, better response mechanisms, and technical assistance, and regulatory mechanisms.

Additional projects were identified in a brief meeting with town staff and the Lodge Grass Mayor at Lodge Grass Town Hall in January 2007.

As part of the public review of the draft plan, the public was expressly encouraged to review the goals, objectives, and mitigation measures and suggest changes.

GOALS AND MITIGATION ACTIONS

Goals, objectives, and projects were developed to respond to specific hazards and concerns.

Participants identified a number of actions that apply to a variety of hazards. These include measures to improve preparation and response to a variety of hazards and are included in Goal 1 to "Improve emergency response and general disaster preparedness."

There are a number of goals, objectives and projects to address specific needs of the town of Lodge Grass. Lodge Grass has significant infrastructure issues and extremely limited resources with which to address those issues. Forty percent of the town's residents are below poverty level (U.S. Census 2000), making it difficult for people to pay for necessities. Because of the town's limited resources, many of the projects that are identified for the Crow Reservation are assumed to also include Lodge Grass (e.g.,

provision of back-up power) and often the town is specifically highlighted in the notes in Table 4.1.

The projects would be for both new and existing buildings and infrastructure where applicable. For example, working to address adequate storm drainage would be something that might require maintenance, repair, or reconstruction of specific sections to protect existing development and infrastructure. It could also benefit potential new development as well. For new construction, review might involve an assessment of drainage, and measures to prevent new development from worsening drainage problems. Many of the actions proposed in the mitigation section for the Community Wildfire Protection Plan (incorporated by reference and goals of which are included in Appendix B) would also work to protect existing buildings and reduce fire hazards related to new construction.

Project Ranking and Prioritization

Ranking projects helps to set the local priorities for accomplishing the plan. Resources to accomplish objectives can be limited in any planning process. Prioritizing helps to identify which projects to start on, given that there are typically far more projects than can be addressed at any one time.

Goals and associated projects were generally prioritized by the participants at the final planning meeting held on September 6. The participants reviewed cost-benefit criteria and other prioritization criteria before proceeding to rank each objective as high, medium, or low priority.

Cost benefit criteria included:

- Number of lives at risk
- Value of property at risk
- Infrastructure at risk
- Risk of business interruption or loss

Participants considered cost-benefit to include an emphasis on cost-effective and technically feasible mitigation actions.

General prioritization criteria included:

- Cost/benefit of the project
- Need (urgency)
- Technical Feasibility/Difficulty
- Political-Public feasibility- Public Acceptance (or not)

As part of the public review of the draft plan, the public was expressly encouraged to review the priorities in the draft and suggest changes.

The following table displays the mitigation actions, the cost-benefit summary, priority ranking, timetable and potential participants (resources) for implementing the action.

Table 4.1 Mitigation Project Prioritization, Cost-Benefit Summary, Schedule, and Potential Resources/Participants

Goals, Objectives, Projects	***Benefits***	***Estimated $ Costs****	**Schedule**	***Rank***	*Responsible Dept (underlined for each objective below) and Potential Resources*
Goal 1: Improve emergency response and general disaster preparedness.					
Objective 1.1 Provide adequate staffing for DES functions. • Assess time needed by DES Coordinator to fulfill various tasks in the PDM Plan as well as regular ongoing duties. • Expand FTE as needed. • Work with TERC to prioritize DES staff time	Reduced risk of injury and loss through better staffing and coordination	Medium	By end of 2007	High	TERC
Objective 1.2 Finalize and adopt the Crow Tribe Emergency Operations Plan. • Identify location(s) of emergency operations center in plan and make provision for adequacy (e.g., back-up power, etc.) • Finish the plan • Chairman adopts plan	Reduced risk of injury and loss through better coordination and planning	Low	By June 2007	High	Tribal Chairman (adopts), DES Coordinator to finalize as needed
Objective 1.3 Continue to improve training and coordination with other response teams. • Share final EOP with other responders (e.g., Big Horn County, Yellowstone County, BIA, National Park Service, etc.) • Memoranda of understanding regarding coordination of emergencies • Develop policy and methods for first response among the variety of agencies for specific types of disasters. Clarify the role of the primary or lead agency, and identify lead agency and back up for each type of disaster. • Continue training exercises with various other responders—find a "neutral" site to promote attendance from all responder organizations (e.g., tribal college—college could provide incentives such as credits for training and provides a "neutral" meeting location) • Continue ICS training and coordination	Reduced risk of injury and loss through better coordination and planning	Low	Ongoing	High	DES Coordinator, TERC, Big Horn County DES, BIA Emergency and Law Enforcement, Fire and Medical Responders (County, BIA, local volunteer Fire Departments), National Park Service on the Reservation, and emergency responders from surrounding counties -Yellowstone, Carbon, Rosebud counties in Montana and Sheridan Co, WY

Goals, Objectives, Projects	***Benefits***	***Estimated $ Costs****	**Schedule**	***Rank***	*Responsible Dept (underlined for each objective below) and Potential Resources*
Objective 1.5 Improve ability to prepare for and respond to a variety of disasters and emergencies					
• Communicate with local radio stations to get notices out, etc. regarding severe weather, road conditions, emergencies, etc.	Reduced risk of injury and loss due to advance warnings	Low	Immediate -ongoing	High	DES Coordinator, local radio stations
• Work to have NOAA weather radios in all critical facilities	Reduced risk of injury and loss due to advance warnings	Low-Medium	By end of 2007	High	DES Coordinator, TERC, FEMA, NOAA
• Provide public information through a variety of methods (including working with schools) on how to prepare and respond to a variety of potential disasters and emergencies including: o Severe summer weather—lightning, thundershowers, hail o Wildfire events o High winds and tornadoes o Severe winter weather o Power outages o Hazardous Materials events o Acts of Terror o Flooding of all types o Events with unlikely potential but severe consequences (e.g., volcanoes, earthquakes, landslides, and seiches)	Reduced risk of injury/loss through better preparation	Low	Begin in 2007; then ongoing	Medium	DES Coordinator, schools, FEMA (source of information pamphlets, etc.)
• Continue to Work with major events (such as Crow Fair) to identify evacuation routes, best ways of providing emergency services, identifying emergency shelters	Reduced risk of injury/loss	Low-Medium	Ongoing	High	DES Coordinator, TERC, Crow Fair Coordinators, Other emergency responders (BIA, Fire, etc.)

Goals, Objectives, Projects	***Benefits***	***Estimated $ Costs****	**Schedule**	***Rank***	*Responsible Dept (underlined for each objective below) and Potential Resources*
Objective 1.6 Continue to provide training and equipment for responders. • Continue training opportunities (see item 1a3)	Reduced risk of injury/loss	Low	Ongoing	High	DES Coordinator, TERC, Other emergency responders (BIA, Fire, Counties, etc.)
• Assess need for "Jaws of Life" for the Crow Agency Volunteer Fire Department	Reduced risk of injury/loss	Low for assessment; High if need to purchase Jaws of Life	By end of 2008 to assess need	Medium	DES Coordinator, TERC, Other emergency responders (BIA, Fire, Counties, etc.)
Objective 1.7 Identify emergency shelters.					
• Identify evacuation and emergency shelters and work to provide back-up power at each location	Reduced risk of injury/loss	Low – Medium	By end of 2007	High	DES Coordinator, Utility Companies (REA indicated some grants may be available for back-up power), TERC, FEMA, Red Cross, local communities, schools, etc.
• Assess adequacy of evacuation and emergency shelters as storm shelters (see Appendix D for general information on community storm shelters). • Upgrade as necessary for adequacy as storm shelter	Reduced risk of injury/loss	Low – to assess High- if upgrades needed	By end of 2008 to assess	Medium	DES Coordinator, TERC, FEMA, Red Cross, local communities, schools, churches, etc.
• Identify sources and process for obtaining food and supplies (e.g., blankets, etc.) until the Red Cross can arrive with their support. Coordinate with local grocery stores (e.g., IGA in Lodge Grass)	Reduced risk of injury/loss	Low	By end of 2008	Medium	DES Coordinator, Red Cross, TERC, local suppliers (e.g., grocery stores)

Goals, Objectives, Projects	*Benefits*	*Estimated $ Costs**	**Schedule**	*Rank*	*Responsible Dept (underlined for each objective below) and Potential Resources*
• Identify and organize for back-up locations for emergency shelters in various communities (e.g., Churches and/or physical activity center in Lodge Grass)	Reduced risk of injury/loss	Low	By end of 2008	Medium	DES Coordinator, FEMA, Red Cross, TERC, local communities, schools, churches, etc.
Objective 1.8 Provide for 24-hour emergency response in Lodge Grass					
○ **Attract and retain volunteers for the volunteer Fire Department**	Reduced risk of injury/loss	Medium	By end of 2009	High	Lodge Grass Town Council, Volunteer Fire Department, DES Coordinators for Tribe and Big Horn County
○ **Have emergency responders for ambulance based 24 hours per day in Lodge Grass**	Reduced risk of injury/loss	High	By end of 2012	Medium	Lodge Grass Town Council, DES Coordinators for Tribe and Big Horn County, IHS, and ambulance services
Goal 2: Improve ability to respond to severe winter weather.					
Objective 2.1 Keep critical routes plowed. • Coordinate with all jurisdictions responsible for roads on or across the reservation--Crow Tribe, BIA, and Big Horn County to identify critical snow plow routes. Clarify first, second, and third priority routes for snow removal. School routes should be addressed, emergency vehicle access, and access to/for the elderly/disabled. • Establish methodology for ensuring these routes are plowed and which entity will have primary responsibility on which routes. Identify back-up plans as necessary. • Share information with the public—including the critical routes, contact information for each route.	Reduced risk of injury/loss	Low (to coordinate) High (to plow and keep roads clear)	By end of 2008 then Ongoing	High	DES Coordinator, TERC, Crow Tribe Public Works, BIA-roads, Big Horn County Public Works, Montana Department of Transportation (state highways)

Goals, Objectives, Projects	***Benefits***	***Estimated $ Costs****	**Schedule**	***Rank***	*<u>Responsible Dept</u> (underlined for each objective below) and Potential Resources*
Objective 2.2 Improve awareness of how to respond to winter weather. • Target education programs for the young, who may have little or no experience with severe winter weather. • Involve schools in the awareness program. ▪ Teaching winter safety tips in school ▪ School to identify and follow guidelines for their response to severe weather—e.g., notification regarding early school closures (include off-reservation schools where Crow students go—e.g., Busby, Billings) ▪ School to share information and procedures with parents, guardians, and public	Reduced risk of injury/loss	Low	Education programs underway by end of 2008, then ongoing	Medium	<u>DES Coordinator</u>, local schools
Objective 2.3 Reduce impacts to livestock from severe winter weather. • Work with landowners and others to identify needs and best mechanisms to address • Identify how to improve access to livestock during snow snowstorms. •	Reduce losses	Low	By end of 2009	Ongoing Medium	<u>DES Coordinator</u>, Agricultural Extension Agents, stockgrowers, agencies responsible for roads (tribal, BIA, county, state)
GOAL 3: Reduce effects of power outages.					
Objective 3.1 Schools, evacuation and emergency shelters, and critical facilities should have working back-up power supplies. • Work with schools to establish and maintain back-up power supplies. Start first with Lodge Grass school to refurbish/repair the existing non-functioning back-up power system because it could also function as the town's back-up system. (Town currently has no back-up power for water supply and other uses) • Identify other schools and critical facilities and work with them to establish/maintain back-up power supplies	Reduced risk of injury/loss	Medium-High	Begin work in 2007; all critical facilities with back-up power by end of 2012, then ongoing	High	<u>DES Coordinator</u>, Schools, critical facilities (including community water supply and wastewater systems), state farm insurance agency (may have grants for these projects)

Goals, Objectives, Projects	***Benefits***	***Estimated $ Costs****	**Schedule**	***Rank***	*Responsible Dept (underlined for each objective below) and Potential Resources*

Objective 3.2 Identify and address issues that could cause or exacerbate power outages.
 	
• Work with power companies to identify preventable causes of power outages , such as:
  o Need to prune tree limbs that might break and cause outages during wind/ice storm events.
  o Need to replace old and weakened power poles
• Encourage power company role in addressing preventable power outages.
	Reduced risk of injury/loss	Medium-High	Begin work in 2007, ongoing	Medium	DES Coordinator, Power companies

Objective 3.3 Expand public education about how to prepare for power outages. • Work with schools and medical facilities to provide education for children, medically at risk, and seniors. • Utilize other methods, such as newspaper and public announcements for the rest of the adult population. (even short announcements reminding people that cordless phones do not work in a power outage could be helpful)	Reduced risk of injury/loss	Low	Begin in 2008, then ongoing	Medium	DES Coordinator, schools, medical facilities, newspapers and media
Goal 4: Reduce potential for fires and improve fire response					
Objective 4.1 Ensure water systems are adequate for fire suppression needs. • Bring all fire hydrants into working order • Ensure adequate water supplies and pressure for concurrent fire suppression and basic public needs • Build additional storage as needed • Install water supply monitors at storage facilities • Identify needs for dry hydrants and install as needed	Reduced risk of injury/loss	High	Begin in 2007, complete projects by 2012	High	DES Coordinator, local and BIA fire departments, Crow Tribe, Lodge Grass Public Works

Goals, Objectives, Projects	***Benefits***	***Estimated $ Costs****	**Schedule**	***Rank***	*Responsible Dept (underlined for each objective below) and Potential Resources*
Objective 4.2 Continue to implement existing fire plans • BIA Wildland Fire plan • Tribal Fire Plan/Community Fire Plans • Applicable portions of the Big Horn County/Yellowstone County CWPP	Reduced risk of injury/loss	High	Ongoing	Ongoing High	Local and BIA Fire Departments, Crow Tribe, TERC
Objective 4.3 Reduce the number of human-caused fires. • Provide education and information to the general population o Work with respected firefighters to help get the word out o Target special programs for pre-school and school age children	Reduced risk of injury/loss	Low	Begin in 2007	High	DES Coordinator, local and BIA fire departments, Crow Tribe, schools
Goal 5: Reduce effect of Hazardous Materials and Transportation-Related Accidents and Disasters.					
Objective 5.1 Ensure timely response to hazardous materials events • Improve communication and coordination among the various responders (e.g, BIA, IHS, National Park Service) • Continue to secure training and necessary equipment for hazardous materials responders-move level of training up from "awareness" to operations and use of Class C suits • Improve coordination with advanced hazardous materials teams (e.g., from Billings) that need to be called in for hazardous materials events that are beyond the certified capabilities of the local tribal team • Review and update Tribal Hazardous Materials Response Plan and relevant portions of EOP as needed	Reduced risk of injury/loss	Medium	Begin in 2007, ongoing	High	DES Coordinator, TERC, emergency responders

Goals, Objectives, Projects	***Benefits***	***Estimated $ Costs****	**Schedule**	***Rank***	*Responsible Dept (underlined for each objective below) and Potential Resources*
Objective 5.2 Identify and address causes of hazardous materials spills and other significant transportation accidents • Work with the Burlington Northern-Santa Fe Railroad to identify major causes of train derailments and potential mitigation measures. • Work with Montana Department of Transportation, BIA, Big Horn County to assess significant problem areas for vehicle accidents and means to address (e.g., problem on Interstate near Crow Agency between mile marker 509 and 511) • Identify pipelines across reservation and work with companies on how to avoid spills and how to address them when they occur	Reduced risk of injury/loss	Low-to identify Medium-High: to address	Initial identification completed by end of 2008	High	DES Coordinator, BNSF Railroad, Montana Department of Transportation, BIA, Big Horn County, pipeline companies and operators
Objective 5.3 Reduce potential for train-related accidents in Lodge Grass					
• **Install a fence separating the city park from the train tracks**	Reduced risk of injury/loss	Medium-High	By end of 2012	Low	Lodge Grass Town Council, DES Coordinators for Tribe and Big Horn County, BNSF Railroad
Goal 6: Reduce effects of flooding.					
Objective 6.1 Consider participation in the National Flood Insurance program. • Invite FEMA representative(s) to present the program to the Crow Tribe. • Assess the benefits and costs of participation and make decision on whether to participate.	Reduced risk of injury/loss	Low	Program presentation and cost/benefit analysis by end of 2008	Medium	DES Coordinator, FEMA, Crow Tribe, Lodge Grass
Objective 6.2 Reduce effects of flooding on community infrastructure • Identify potential effects from flooding to water supply and sewage treatment systems along rivers and floodprone areas. As necessary, identify alternatives to address issues. (Note: already identified as an issue for Crow Agency.)	Reduced risk of illness, injury, and loss	Medium-High	Identification of issues by end of 2008,	High	DES Coordinator, Tribal Health Department,

Goals, Objectives, Projects	***Benefits***	***Estimated $ Costs****	**Schedule**	***Rank***	*Responsible Dept (underlined for each objective below) and Potential Resources*
Objective 6.3 Use best available information to locate new development outside of flood-prone areas. • Until other information, such as Flood Hazard Boundary Maps, are available, use the aerial photographs of the 1978 flood (estimated as the 150 year event) • Make sure that the DES office has copies of the Flood Hazard Boundary maps and aerial photographs	Reduced risk of injury/loss	Low	By end of 2008	Ongoing Medium	DES Coordinator
Objective 6.4 Address poor storm drainage in communities and on roadways.					
• Address storm drainage issues in downtown Lodge Grass	Reduced risk of injury/loss	High	By end of 2010	High	Lodge Grass Public Works, DES Coordinator, Montana Department of Transportation, BIA, Crow Tribe
• Assess and address need for storm drainage improvements in Crow Agency and other communities	Reduced risk of injury/loss	High	By end of 2010	High	DES Coordinator, Crow Tribe, BIA
• Work with BIA, Big Horn County, Montana Department of Transportation, Crow Tribal Public Works to identify storm drainage issues for roads o Identify areas throughout reservation prone to washouts (e.g., roads to St. Xavier, Pryor, and "Wyola Loop") o Assess bridges and culverts and identify those needing upgrades or repair	Reduced risk of injury/loss	High	By end of 2012	Medium	DES Coordinator, Crow Tribe, BIA, Big Horn County Public Works, Yellowstone County Public Works, Montana Department of Transportation
Objective 6.5 Reduce flooding caused by channel blockage.					
• Identify and address blockages caused by beaver, downed trees, debris, etc. in Lodge Grass	Reduced risk of injury/loss	Medium-High	By end of 2010	High	Lodge Grass Public Works, DES Coordinator, BIA, Crow Tribe

Goals, Objectives, Projects	***Benefits***	***Estimated $ Costs****	**Schedule**	***Rank***	*<u>Responsible Dept</u> (underlined for each objective below) and Potential Resources*
• Identify and address blockages caused by beaver, downed trees, debris, etc. in other communities on the Reservation	Reduced risk of injury/loss	Medium-High	By end of 2012	Medium	<u>DES Coordinator</u>, BIA, Crow Tribe
Goal 7: Improve Emergency Communications					
Objective 7.1 Continue to work on communications coordination and interoperability of systems among various jurisdictions and governments. • Continue to participate in the Big Sky 11 Consortium as part of the overall Interoperability Montana project. • Coordinate with the various responders to develop a system to: o Ensure ability to communicate with each other o Avoid situations where too many persons on the channel/ frequency create confusion • Continue to upgrade equipment (e.g., radios) as needed	Reduced risk of injury/loss	Coordination: Low Equipment upgrades: Medium-High	Ongoing	Medium	<u>DES Coordinator</u>, TERC, emergency responders, BIA, Crow Tribe
• Implement the centralized dispatch system being developed on Crow Reservation	Reduced risk of injury/loss	Medium	By end of 2007	High	<u>TERC</u>, Crow Tribe, BIA
Objective 7.2 Work to ensure repeaters are in place as needed. • Work to ensure existing repeaters are addressed as priorities for operation, maintenance, and protection from disaster events (e.g., wildfire) • Develop back-up plans for when repeaters go “down.” • Identify need and location for any new repeaters and work to install as necessary.	Reduced risk of injury/loss	Medium-High	Ongoing	High	<u>DES Coordinator</u>, TERC

Goals, Objectives, Projects	***Benefits***	***Estimated $ Costs****	**Schedule**	***Rank***	*Responsible Dept (underlined for each objective below) and Potential Resources*
Goal 8: Reduce effects of drought					
Objective 8.1 Assess various demands for surface water supply and work to balance trade-offs among uses. • Identify existing demands and quantify use by type, including agricultural, community water supplies, needs for wildlife and fisheries. • Bring various parties together and begin a dialog on ways to address long-term effects of drought on surface water. • Identify potential effects of drought on community water supply and wastewater treatment systems and identify alternatives to address issues. (Note that water quantity has been an issue for Crow Agency in past few years.)	Reduced losses, sustainable environment	Medium	By end of 2008	High	DES Coordinator, Crow Tribe, BIA Natural Resources, State of Montana Dept. of Natural Resources, Agricultural Extension, water users (agricultural, residential,commercial, industrial, etc.)
Objective 8.2 Participate in other drought-related efforts in the region (e.g., Big Horn County, Yellowstone County, state level, etc.)	Reduced losses, sustainable environment	Low	Ongoing	High	DES Coordinator, Crow Tribe, BIA Natural Resources, local, state, and federal agencies
Goal 9: Reduce impacts from downed tree limbs from high winds, ice storm, and heavy snow					
• Trim dead and diseased limbs from large trees around Lodge Grass and other communities	Reduced risk of injury/loss	High	By end of 2012	Medium	Lodge Grass Public Works, DES Coordinator, Montana Department of Transportation
Goal 10: Reduce potential for spread of disease and injury from loose animals					
• Reduce the number of loose dogs and horses that run through Lodge Grass • Reduce the incidence of rabies among dogs	Reduced risk of injury/loss	Medium	By end of 2010	Medium	Lodge Grass Public Works, DES Coordinators

Goals, Objectives, Projects	***Benefits***	***Estimated $ Costs****	**Schedule**	***Rank***	*Responsible Dept (underlined for each objective below) and Potential Resources*
Goal 11: Plan Administration					
Objective 11.1 Submit plan to the State of Montana and FEMA for approval.	Greater likelihood of project implementation and potential eligibility for project funding	Low	By April 2007	Not rated	DES Coordinator, Tribal Council, Town of Lodge Grass
Objective11.2 Ensure coordination with other planning efforts • Incorporate elements of the PDM plan as appropriate into other plans or regulations (e.g., as Crow Tribal zoning and land use regulations are revised) • When updating or revising the PDM plan, incorporate elements of other plans as appropriate	Greater assurance the projects will be implemented	Low	Ongoing	Not rated	DES Coordinator, Tribal Council (for Crow Tribe); Mayor and Public Works Director for Lodge Grass

*Estimated costs: Low = $ 10,000 or less, Medium = $ 10-100,000, High = $ 100,000 or greater

PROJECT IMPLEMENTATION

The projects listed above are the means by which the Crow intend to realize the goals to become more disaster resistant. Accomplishing the projects will be dependent on funding, staff, and technical resources from a variety of sources including the Tribe, state and federal government, not-for-profit organizations, and the business community.

Some of the projects can be undertaken by the Tribe within existing resources. One example of this would be to get more information from FEMA on participation in the National Flood Insurance Program, and to assess costs and benefits of participation in the program for the Tribe. Another would be to provide information on how to prepare for various types of disasters.

Some of the projects will need additional funding in order to be completed. The amount of funding needed depends on the project and in many cases more information on specific project solutions is needed before more accurate cost estimates can be obtained. For example, more clarification on specific solutions to the storm drainage issues in Lodge Grass are needed.

Some of the projects will require a public-private partnership to accomplish. An example of this would be measures to prevent power outages—identifying these measures and implementing will necessarily involve the utility companies.

Some projects may require cooperation with other organizations outside of the Reservation. Projects to improve emergency communication interoperability (the ability of different emergency responder groups to communicate with each other) will require participation of the various emergency response entities. As noted above, this is an ongoing effort in the multi-county region around the Reservation as well as statewide in Montana.

Projects will be accomplished as resources become available. Those projects with a higher priority ranking would be considered first. Implementation of the plan will be the responsibility of the Disaster and Emergency Services Coordinator and the TERC. Plan implementation also depends on the willingness of other tribal departments (e.g., public health, housing), BIA, public entities (e.g., the schools), private business (such as the electric companies), and not-for-profit organizations such as the American Red Cross to participate in specific mitigation actions and projects.

In selecting projects to compete for funding whether it is existing internal funding or funding from federal sources, emphasis should be placed on the relative benefits compared to the cost of the project. The cost of the project should be considered and weighed against the dollar value or other measure of assets protected or potential reduction of damages. Where possible a basic cost benefit and/or value analyses should be completed during the planning of the project.

The Crow Tribe and municipality of Lodge Grass understand that while completion of the plan will make them eligible to compete for additional federal funds, it is in the best interests of the local jurisdictions and residents to proceed with those projects that can be done within existing resources while exploring avenues to obtain assistance for those projects beyond local capabilities.

CHAPTER 5:
PLAN MAINTENANCE AND COORDINATION

RESPONSIBLE PARTIES

The Crow Tribal Chair will be responsible for ensuring that the PDM Plan is kept current and also for evaluating its effectiveness. With the adoption of this plan, the Chair designates the Crow Disaster and Emergency Services Coordinator and the Chair of the Tribal Emergency Response Commission (TERC) as the co-leads in accomplishing this ongoing responsibility on the Chair's behalf.

The Mayor and Public Works Director of the Town of Lodge Grass will be responsible for ensuring that Lodge Grass is actively involved in the maintenance and coordination of the portions of this PDM plan that pertain to the municipality of Lodge Grass.

REVIEW TRIGGERS

Any of the following three situations could trigger review of the plan's effectiveness or currency and update of the PDM Plan.

1. The occurrence of a major natural disaster either on the Reservation or nearby.
2. The passage of time.
3. A change in federal regulations with which the Reservation must comply.

CRITERIA FOR EVALUATING THE PLAN

When review of the PDM plan is triggered by one of the three situations listed above, the plan will also be evaluated for effectiveness and comprehensiveness. The criteria against which the plan will be evaluated will include, but not be limited to:

- Whether any potential natural hazards have developed that were not addressed in the plan,
- Whether any disasters have occurred which were not addressed in the plan,
- Whether any unanticipated development has occurred that could be vulnerable to natural disasters, and
- Whether any additional project ideas have been developed.

PROCEDURES

Should a major natural disaster occur on the Crow Indian Reservation the TERC shall meet following the disaster to review the after action report. Upon review of this report, any changes needed to the PDM Plan will be recommended to the Crow Tribal Chair and made by the Disaster and Emergency Services Coordinator following the Chair's decision.

In the absence of a major natural disaster, each year starting in January 2008, the TERC will meet to review the PDM Plan and recommend any needed changes. The primary emphasis of such review will be on the goals, objectives, and specific actions/projects portion of the plan. The TERC will:

- review the work of the past year, identifying key factors that may have affected accomplishing priority projects, and identifying completed projects
- identify any needed changes or additions to the mitigation strategy (new or changed goals, objectives, actions/projects)
- clarify priorities for projects for the upcoming year and the work tasks needed to accomplish those projects

The TERC meeting will be noticed in local newspapers and the public and individuals who served on the Steering Committee for development of the original plan will be encouraged to attend. In the interim, the Disaster and Emergency Services Coordinator will maintain a file into which comments or input on changes to the plan can be kept. The comments in this file will be provided at the TERC/public meeting to review the plan.

Finally, should federal regulations with which the Reservation must comply be significantly changed, the Disaster and Emergency Services Coordinator will notice and hold a TERC meeting. At this meeting he/she will inform the TERC of the new requirements and together with the TERC, determine whether changes to the PDM Plan are warranted.

Every five years, beginning in 2012, the CWPP/PDM Plan will be updated and submitted to Montana Disaster Emergency Services and subsequently to the Federal Emergency Management Agency (FEMA) for approval.

INCORPORATION INTO OTHER PLANS

Staff of the Crow Tribe, the town of Lodge Grass, and the BIA have been made aware of the PDM Plan throughout the planning process. The projects in the PDM Plan can be incorporated as appropriate into existing plans, annual budgets, and any other relevant plan that may be updated or developed for the Crow Indian Reservation or the town of Lodge Grass .

Processes for developing and updating plans on the Crow Reservation vary according to branch of government (e.g., BIA or Crow Tribal Administration) and can also vary depending on direction from the Tribal President and Tribal Council. The DES Coordinator will be responsible for staying informed of other relevant plans and working to incorporate pertinent elements of the PDM plan as appropriate.

The Lodge Grass Public Works Director and Mayor were involved in developing this Crow PDM plan as well as the Big Horn County PDM Plan, both of which incorporate concerns of Lodge Grass. These persons will take the lead in ensuring that the PDM plan is incorporated into other relevant plans as they are developed and/or updated.

The Crow Tribe is currently reviewing its land use and zoning regulations. The DES Coordinator will be responsible for bringing PDM-related issues to the attention of the relevant review committees and individuals. Land use regulations, such as zoning, can be a powerful tool in reducing the likelihood that new development is hazard-prone.

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APPENDIX A

STEERING COMMITTEE MATERIALS

INVITATION LIST, AGENDAS, SUMMARIES, AND ATTENDANCE SHEETS

PERSONS SENT INVITATION LETTERS AND FOLLOW-UP CORRESPONDENCE REGARDING MEETINGS

Ackermann	Laura	Decker Coal Co.
Adams	Ron	Mayor of Hardin
Alden	Orrin	Facilities
Alexander	Sally	Hardin Schools
Auker	Ed	BHC DES
Auker	Luana	IHS-PHN
Back Bone	Harold	Crow Housing Authority Board Member
Back Bone	William	Crow Housing Authority Board Member
Bad Bear	Byron	Facilities
Barnette	Kirk	Rural Addressing
Beardon	Wes	Building Inspector- Hardin
Bends	Darrell	Mayor of Lodge Grass
Big Man	Lydina	Northern Cheyenne Fire and Aviation
BirdinGround	Gilbert	Little Big Horn Casino-General Manager
Bird-In-Ground	Anita	Headstart Director
Brooks	Sandy	BLM - Billings Field Manager
Bruckner	Roger	FSA County Excutive Director
Bryson	Rob	HVFD
Buffington	Carson	MDOT Hardin
Bushey	Chuck	Montana Prescribed Fire Services, Inc.
Collins	Steve	BIA Fire
Cook	Darrell	National Park Service
Cook	Darrell	National Park Service -Battlefield
Costa	Larry	Legislator Branch-Black Lodge
Costa	Oliver	Legislator Branch-Pryor
Covers Up	Mararet	Natural Resource Dispatch
Covers Up	Sylvan	Fish & Game Officer Natural Resource
Covers Up	Manuel	Legislator Branch-Lodge Grass
Crane	Bob	State Farm Insurance
Creek	Clay	MHP
Crockford	Dick	Big Horn County News
Crooked Arm	Vincent	Legislator Branch-Big Horn
Cummins	Leroy	B.I.A. Facilities Manager
Dannenberg	Mike	BLM
Dean	Wendy	Extension
Doyle	John	BHC Commissioner
Driftwood	William	Crow DES
Eastman	Ed	BIA Law Enforcement
Enemy Hunter	Luke	Pryor Schools, Superintendent
Falls Down	William	Natural Resource Department
Falls Down	Dexter	Crow Housing Authority Board Member
Fenner	Chad	BHC Commissioner
Fighter	Ertis, Sr.	Legislator Branch-Black Lodge
Fitspatrick	Sidney, Sr.	Legislator Branch-Center Lodge

Fritzler	Dell	Pryor Schools
Glenn	Shirleen	Crow Housing Authority Board Member
Goes Ahead	Carlson	Legislator Branch-Pryor
Goethals	George	Big Horn County Electric
Green	Paul	BHC Study Commission
Grinesell	John	N.C. B.I.A. Law Enforcement
Grose	Gene	Crow Public Schools Principle
Haines	Deb	IHS/EHS
Hanson	Charlie	District DES Coordinator
Herbel	Jim	Rancher
Herrera	Calvin	Tribal Forestry
Hodges	Bill	Public Health Director
Hogan	Valerie	Health and Human Services
Hogan	Llyod, Jr.	Legislator Branch-Center Lodge
House	Bruce, Sr.	Legislator Branch-Black Lodge
Howe	Keven	Natural Resource Department
Hugs	Jill	Crow Housing Authority Board Member
Icenoggle	Joe	Fidelity Exploration and Production Co.
Iron	Ralph, Jr.	Legislator Branch-Big Horn
Jefferson	Gavin	Multi-purpose Building
Johnson	Charlene	I.H.S Director
Johnson	Gabe	Spring Creek Coal Co.
Kortlander	Christopher	
Kruger	Rick	BHC SO
Kurk	Darrell	DNRC
Lang	Dena	BLM-Eastern MT Fire Zone
Larry Plain Bull	Larry, Sr.	Legislator Branch-Pryor
Last	First	Affiliation
Lavato	Joe	Lodge Grass
Leach	Ian	BLM
Little Coyote	Eugene	Northern Cheyenne President
Little Light	Clyde	Crow Housing Authority Board Member
Lonefight	Edward	B.I.A. Superintendent
Luther	John	Historical Preservation
Means	JR	N. Cheyenne EMS
Medicine Horse	Thomas	Big Horn Co Sheriff's
Medicine Horse	Larson	BHC Sheriff
Mehling	Beth	Big Horn County Insurance
Merchant	Frank	B.I.A Administrative Manager
Miller, Jr.	Bill	LGVFD
Miller, Sr.	Bill	LGVFD
Mische	Marie	Little Big Horn Camp
Molina	Pete	BHC SO
Morrison	Benito	Fish & Game Natural Resource
Morrison	Carolyn	GAP Coordinator
Murdock	Ellis	BHC Study Commission
Not Afraid	Marlon	Legislator Branch-Big Horn
Not Afraid	Leroy	Legislator Branch-Lodge Grass

O'Banion	Daniele	BHC EMS
Old Bear	Lee	Northern Cheyenne Fire and Aviation
Old Crow	Rudolph, Sr.	Legislator Branch-Lodge Grass
Old Elk	Carol	Law Enforcemant Services Telecommunication
Osborne	Rich	NorthWest Energy
Pease	Diane	Little Chief
Pease	Robert	BH Co Sheriffs
Peregoy	Sharon	Crow Tribe Health Department
Peterson	Al	17H & 1 School Superintendent
Pretty On Top	John	BHC Commissioner
Pretty On Top	Burton	Public Relations Director
Pretty Paint	Roberta	Abnoxtion Weeds Coordinator
Real Bird	Kennard	Legislator Branch-Center Lodge
Redden	Matt	BHC Road & Fire
Redden	Dan	Big Horn County Roads
Redden	Dennis	USBR Yellowtail Field Office
Reece	Keith	Multi-purpose Building
Reece	Ron	Housing Authority Human Resource Manager
Rides Horse, Jr.	Henry	Crow TERC
Rides The Bear	Jeff	Crow Homeland Security
Rokita	Rusty	
Rossetto	Tom	Westmoreland Resources
Rowland	Joanie	Minerals & Mining
Russell	Scott	Crow Housing Authority Board Member
Scheidt	Dianna	BHC Museum
Schinderline	Shane	Lodge Grass Chief VFD
Schlenker	Linden	National Park Service
Schwaiger	Pat	Public Health
Shane	Beverly	Legislator Branch-Wyola
Sioux	Merlin	N. Cheyenne Fire
Small	Kurrie	Crow Envirormental Protection
Small	Paula	Heritage Acres
Smith	Burton	Rancher
Smith	Crystal	Lodge Grass Farmers Union
Snow	Rob	Busby VFD
Solberg	Rich	KHDN Radio
Spencer	Sherry	Big Horn County Fire Dept.
Spotted	Kenneth	GAP Assistant
Stenerson	Bill	
Stewart	Davie-Jean	B.I.A. Deputy Superintendent
Stewart	Elwyn	Supervise Maintanance
Stewart	Susan	Plenty Coups State Park
Stone	Jonathan	Legislator Branch-Wyola
Stops	Sandra	Shake & Burger Hut
Storey	Ronald	Ft. Smith VFD
Taft	Craig	BHC Sanitarian

Trahan	Nicole	St. Charles School Principle
Upchurch	Dr. James	IHS/EMS Director
Van Aarsdel	Lynn	Office of Public Assistance
Vandersloot	Larry	Public Works Superintendent
Venne	Carl	Chaiman, Crow Nation
Venne	Adwina	Enrollment Director
Watt	Jim	Crow Mercantile
Watts	Chip	BHC Study Commission
Weglether	Mike	Apsalooka Mine
	Jenny	
White	Darling	Wyola Schools Superintendent
Williamson	Garla	Pretty Eagle School
Wilson	Henry	Project Telephone
Wilson	Dana	Legislator Branch-Wyola
Woods	Doug	Lodge Grass Schools Superintendent
Yarlott	David	Little Big Horn College
	Terry	Little Horn I.G.A.
		7th RV Camp
		Cowboy Shop
		Lodge Grass Propane & Supplies
		River Crow Trading Post
		Apsalooke Trading Post
		Big Horn County Electric-Lodge Grass
		Big Horn County Roads Dept. Shop
		Hardin Generating Station

Tribal letterhead Date

Dear :

You are invited to serve on the Steering Committee to guide the preparation of the Crow Pre-Disaster Mitigation (PDM) Plan.

So, what is this plan and what purpose does it serve? The primary purpose of the Plan is to increase the Crow Reservation's resistance to natural disasters. Among other things, the PDM will look at historic disasters, identify those types of disasters the area is at most risk from, and propose projects to address those hazards.

And, there are important benefits for the Reservation in preparing the plan. Once the plan is done, we will be eligible to compete for federal grant funds to complete projects, and eligible for assistance from the Federal Emergency Management Agency (FEMA) in the event we do experience a disaster such as a devastating flood, wildfire, or winter storm, for example.

The commitment we are asking of you is simple. Between now and the end of the year, we'd like to have you attend three two-hour Steering Committee/Public meetings. At these meetings, the Steering Committee and interested participants will provide guidance to the contractor we've hired to write the plan. The first of these meetings is scheduled for Wednesday, May 17 at 10 a.m. in the Multi-purpose room of the Absalooka Center. We hope to see you at as many of the three meetings as you can make, preferably all three.

Your participation will ensure that we develop the highest quality plan possible. If you have any questions about the plan or your role as a Steering Committee member, please call William Driftwood, Crow Disaster and Emergency Services Coordinator at 638-3832.

Sincerely,

Carl Venne
Tribal Chairman

CROW TRIBE
PRE-DISASTER PLANNING MEETING

Wednesday, May 17
10:00 a.m.
Location: MULTI-PURPOSE ROOM,
ABSALOOKA CENTER

Open to the public.
Anyone with an interest is encouraged to attend and participate.

For more information, contact:
Disaster Emergency Coordinator, William Driftwood, 638-3832

Big Sky Briefs

0606080408

Thursday
June 8, 2006

"THE BRIEFS" *Big Horn County's #1 Daily 665-1175*
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Crow Tribe Disaster Planning Underway

(Crow Agency) The Crow Tribe has begun planning to reduce effects of disasters on the reservation. A similar plan is underway on the Northern Cheyenne Reservation.

Recent disasters have heightened concern about disaster preparedness, and while hurricanes aren't a concern here, there are plenty of other real disasters that can or have affected the Crow Reservation.

Intensive rains and snowmelt in 1978 caused tremendous flooding along the Little Big Horn and Big Horn Rivers. Most of Crow Agency an much of Lame Deer were inundated. Approximately 5,000 head of cattle in the county were lost to the flood.

Floods are just one of the potential disaster events. Wildfires, winter storms, hail storms and drought are also historical disasters. And putting the pieces back together after a natural disaster is costly.

For all these reasons, the Crow Tribe is joining other tribes across the country to prepare Pre-Disaster Mitigation Plans (PDM) specific to their reservations. Preparing a plan is a requirement for eligibility for emergency relief funds from FEMA, should the reservation experience a natural disaster.

"The primary purpose of the Plan is to increase the Crow Reservation's resistance to natural disasters. Among other things, the PDM will look at historic disasters, identify those types of disasters the area is at most risk from, and propose projects to address those hazards," said Crow Tribal Chairman Carl Venne.

Continued on Page 8 "Pre-Disaster Plan"

"Pre-Disaster Plan" Continued from Page 1

Cossitt Consulting, from Park City, will prepare the disaster mitigation plan under the guidance of a steering committee consisting of an expanded Crow Tribal Emergency Response Commission. Invited to participate are elected officials, law enforcement, EMS, fire protection, public health, public works, private businesses schools, and others as well as the general public. A total of three meetings to develop the plan will be scheduled over the next six months, and anyone interested in participating is encouraged to do so.

The first Pre-Disaster Mitigation Plan Steering Committee Meeting is scheduled for June 12th, at 10:00 am in the Multipurpose room of the Absalooka Center. For more information, contact Susette Nanto-Spang at 638-3832.

Crow PDM Steering Committee
June 12, 10 a.m.
Meeting Agenda

Introductions

Pre-Disaster Mitigation Planning

- What is a PDM Plan and why do one?
- What is the role of the Steering Committee?
- What are the overall timeframes and schedule for the project?

Recollections

- Steering Committee recollections of past natural disasters in the county (what type of disaster, when, where, extent of seriousness)
- Other resources to obtain this/related information?
- What is in place now to respond to disasters?
    - EOP?
    - Evacuation Plans?
    - ?

Potential natural disasters

- Group brainstorm of natural hazards
- Probability of Occurrence and Risk Severity
- Prioritize list of potential disasters

Critical facilities and vulnerable populations

- What are the critical facilities and infrastructure?
- What are the vulnerable populations?

Wrap-up

- Next steps
- Next meeting date/location/time --CROW FAIR? Others?
    - August 1 (Tues), Aug 2 (Wed), Aug 8 (Tues), Aug 9 (Wed)
    - Sept 6 (Wed), Sept 7 (Thurs), Sept 26 (Tues)
- Questions and comments
- Adjourn

Meeting Summary
Crow Reservation PDM Steering Committee
Apsalooka Center
June 12, 2006

Welcome

Burton Pretty on Top, Sr., Crow Public Relations Director, welcomed the group and introduced Anne Cossitt, contractor to the Crow Tribe to prepare a Pre-Disaster Mitigation Plan. Participants introduced themselves.

Cossitt briefly reviewed the agenda and indicated that this is the first of three meetings of the PDM Steering Committee. The purpose of this meeting is to identify and prioritize hazards. The second and third meetings will be to set goals and identify projects to reduce risks.

What is a CWPP-PDM Plan?

Cossitt presented the benefits of preparing a Pre-Disaster Mitigation (PDM) Plan and generally what goes into the plan. The resulting plan will among other things identify projects that can make the reservation more disaster-resistant.

Participants in the Planning Process

Cossitt discussed role and membership of the Steering Committee. Crow Tribal Chairman Carl Venne sent a letter inviting participation on the steering committee to approximately 150 individuals representing a variety of interests. This is the first meeting of the steering committee, explained Cossitt.

The steering committee provides information and ideas, identifies projects, sets priorities and will be asked to review the draft plan. Steering committee members are asked to attend as many of the three steering committee meetings as possible. The meetings will be kept to about two hours each.

Ideally, the steering committee is made up of emergency service providers, businesses, education (schools), medical providers, agricultural services, insurance providers, and others to get a broad scope of sectors that could be affected by disasters.

The tribal council will make the decision to adopt the final product. The entire process is open to the public. Efforts to include the public include notices in the paper (e.g., Big Sky Briefs).

Anne Cossitt of Cossitt Consulting will research and write the plan, with guidance from the steering committee.

Time Frames and Schedule

The plan will be completed by December 31, 2006. Future meetings will be dedicated to goal setting and project identification.

Recollections of Past Disasters

Cossitt asked participants to provide information on previous disasters. Cossitt will provide detailed information on hazards and include information on these disasters as part of the background work for the plan.

What?	When?	Where?	Extent-Severity/ Other Notes
Flood	?	Crow Agency	Flood shut down the power pump in Crow Agency—part of the hospital had to be evacuated
Flood	1978	Little Big Horn	Lodge Grass –there are two wells that supply the town—if the power goes out there's no water
Flood	Now	Lodge Grass	Fallen trees are jamming the creek near Lodge Grass
Flood	1978	Throughout Reservation	Floods took out bridges—isolating communities – Pryor was mentioned specifically
Wildfire	?	Crow Agency-Crow Fair Campground	The wildland fire cut off roads. Fire was not during Crow Fair, but the concern is that it could happen.
Wildfire	1983	Little Big Horn Battlefield	
Tornadoes	???	Crow Agency	2 houses were damaged in Apsalooka Heights in Crow Agency, on trailer house turned over
		Benteen	Roof taken off
High winds	5-6 years ago	Benteen area	Wind took out 5-6 miles of power poles
Hazardous Materials	October 2005	Crow Agency	Trailer truck with hazardous materials overturned near Crow Agency; railroad and 2 highways in area
Winter Storm	October 2005	Crow Agency (throughout reservation?)	Winter storm that lasted two days. Some people were without power for 2 days. Some homes had to be evacuated. Trees were still leafed out, so snow broke branches and there was a lot of resultant debris removal.
Drought	Severe drought over much of last decade	Reservation-wide	$70 million annual in lost agricultural production (as noted by insurance agent present at the meeting)
Hail	Every year	Reservation-wide	
Power Outages	Can happen winter or summer	Reservation wide	The hospital sometimes shuts down the outpatient unit to save power during power outages; once the back-up generator failed and they went to the back-up, but they had to send patients to Hardin (per Ed Auker, County DES)
Volcano-ashfall	Date of Mt. St. Helen's	Reservation wide	Schools shut down because of ashfall and air pollution
Earthquakes			Have been recorded in Big Horn County and vicinity
Landslides		Yellowtail Reservoir	Landslide have occurred around the Bull Elk area on Yellowtail; and there is some concern about potential seiches (large wave movement) that could be caused by landslides or earthquake
Dam Failure			Potential for Yellowtail dam and/or dams above Lodge Grass to fail and cause major downstream flooding.
Power Outages	Could occur winter	Reservation wide	• Are costly to individuals who may lose food in

	or summer		their freezers, etc. • The Lodge Grass school generator could power the town, town's water wells in an emergency, but the generator needs about $1,000 worth of repairs
Communications	Ongoing		Lost the Wolf Mountain repeater for a while—(exact date???); generally there is need for back-up plans for lost communication
Extreme Heat		Reservation-wide	Extreme heat can cause power outages and can also affect train track/rails and increase potential for accidents

Issues:

Hazardous materials. Response time for a hazardous materials response team to be on-site on the Crow Reservation can vary from 4-6 hours. They have to come from Billings.

Evacuation Plans. Evacuation plans need to be noticed to the public (and responders).

Water in Wyola. Wyola was without water for a while—not sure how long exactly—but it was within the past year. Talk to J.D. Stone, Bobby Schinderline.

Communications. Repeater in the Wolf Mountains is critical.

Hazards of Concern

Participants then went through a variety of hazards and identified the likelihood that a hazard event might take place and the potential severity of an incident. Finally, the group identified the highest priority hazards (each person was given three sticky dots which they used to vote for their highest priorities).

The following table summarizes the discussion of these hazards.

Hazard	Priority Ranking (# dot "votes")	Probability of Occurrence	Risk Severity	Notes
Flood- Dam Failure		Low	High	
Flood- Ice Jams		Medium	Low-Medium	
Flash Flood	4	Medium		Would vary according to location of flash flood and what could be damaged/destroyed Participants indicated roads can be washed out—toward St. X, and also the back road (Wyola loop) to Wyola
Flood-from channel blockage	1			Probability for occurrence is high around Lodge Grass according to residents; and residents there also said severity could be high
Wildland Fire	7	High	High	
Tornadoes		Medium	High	
High Wind	1	High	Medium-High	

Hazardous Materials	6	High	High	
Winter Storm	10	High	High	
Winter Cold	2	High	High	Participants indicated the economic stress of paying higher heating costs.
Train Derailment	1	Low	High	
Acts of Terrorism	1	Low	High	Participants mentioned potential for incidents at large gatherings/events such as Crow Fair
Drought		High	High	High economic costs
Hail		High	High	Economic costs for damage to structures and vehicles; also damage costs for agricultural crops
Power Outages	10	High	High	
Lightning	1	High		Severity depends on what it hits (severity of lightning-caused wildfires addressed under wildfire)
Summer Heat		High	Low-High	Severity can range from low (inconvenience) to high (when agricultural crop value decreases
Communications	3			Ongoing issue; reservation needs NOAA weather radios in critical facilities; reservation is working with others on "interoperability" project that will improve communication among a variety of responding agencies.
Volcanoes		Low		Ashfall could result in health issues
Earthquakes		Low	High	
Landslides		Low	High?	Depending on where they occurred, landslides could have high potential severity. Concern was expressed about landslides causing seiches in Yellowtail Reservoir.

Critical Facilities and Vulnerable Populations

Cossitt indicated that serious issues can develop when hazards affect delivery of key services or affect or interrupt business, including government business. It is important to consider what buildings and facilities might particularly be at risk. In addition, the plan will need to consider the special needs of vulnerable populations such as children, seniors, and the medically at-risk.

Wrap-Up

Cossitt thanked everyone for their participation and ideas.

Cossitt suggested some dates in August and September for the next two meeting dates. Cossitt will work with Susette Nanto Spang, Acting Crow DES Coordinator, to set dates and location.

Attendance Sheet

Activity Crow PDM Steering Committee

Location Crow Agency Date(s) June 7, 2006

Duration 10 am –

Name & Title	Affiliation	E-Mail Address & Phone#	Agency Use Only H	M	T
Name: Ronald W. Reece Title: H.A. MGR	Crow Tribal Housing Auth.	rreece@crowhousing.org 638-2665			
Name: Susette Nagata-Spang Title: Crow Nation Public Safety/OES	Crow Nation	638-3832			
Name: Bob Crowe Title: State Farm Ins. Agent	Local Business	665-1006			
Name: Luana Auker Title: Director, Public Health Nursing	Indian Health Service Crow Service Unit	luana.auker@ihs.gov 638-3478			
Name: Sally Alexander Title: School Counselor	Hardin School District	665-1781 salex-6851@yahoo.com			
Name: Ed Auker Title: Big Horn Co. DES Coor.	Big Horn County	eauker@co.bighorn-mt.us			
Name: Joe Lovato Title: PWS MGR	Town of Lodge Grass				
Name: Tanya Watson Title: Supervisor	Big Horn Co. OPA	Twatson@mt.gov			
Name: Brenda Rush Title: County Director	Big Horn Co. OPA	BRush@mt.gov			
Name: DANIELE O'BANION Title: EMS Director	Big Horn Co Ambulance	ambulance@co.bighorn.mt.us			
Name: AL Peterson Title: Supt.	Sch. Dists 17;1	apeterson@mcn.net 665-1304			
Name: Harold Backbone Title: L.G. Fitness Center	Crow Tribe	639-2486			
Name: Roger Bruckner Title: County Executive Director	USDA Farm Service Agency	roger.bruckner@mt.usda.gov 665-3442			
Name: Burton Pretty On Top Sr. Title: Asst.	Crow Public Relations Dir.	638-7312 Burtonp@crownations.net			
Name: Tori Yarlott-Half Title:	Crow Public Relation				
Name: Ed Eastmum Title:	BIA IOLES Crow Health				
Name: Rico Rondeaux Title:	BIA-OLES Crow Agency				
Name: Lydine BigMan Title: ~~KEITH E. REECE~~	BIA- Forestry N. Cheyenne	P.O. Box 40 Lame Deer, MT 59043			
Name: KEITH E. REECE Title:	Crow Multi	665-2492			

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FC 205

Attendance Sheet

Activity Crow PDM Steering Committee

Location Crow Agency Date(s) June 12, 2006

Duration 10 am —

Name & Title	Affiliation	E-Mail Address & Phone#	Agency Use Only H	M	T
Name: Michael Stops Title: Chief Ranger	NPS	michael_stops@nps.gov 406-638-3215			
Name: Dennis Morrison Title: Fish and Game Natural Resource	Crow Tribe	Morrisonfb@cablenet.net 406-638-3752			
Name: Reinhold + Marie Mische Title:		LittleBigHorn Camp			
Name: Julie Rideshorse Title: Nutrition Health + Safety	Crow Head Start	jas_etc@yahoo.com 6383740; 665-6272			
Name: Bobbi Schenderline Title: Sec/Tres-Lodge Grass VOL FD	Lodge Grass volunteer fire Dept	bSchenderline@nemontel.net 639-9164 - 679-1340			
Name: Shane Schenderline Title: Chief	Lodge Grass Vol. Fire Dept.	SSchenderline@netzero.com 639-9164			
Name: Merlin Sioux Title: Northern Cheyenne Fire	NC Tribe	nctribedepartment@rangeweb.net 477-8161			
Name: Gabe Johnson Title: Senior Environmental Engineer	Spring Creek Coal Mine	gabe.johnson@riotinto.com 406-757-4236			
Name: Luke Enemy Hunter Title: Superintendent	Pryor Public School	259-7924			
Name: KEN TOINEETA Title: MINE CARTOGRAPHER	APPSALOOKE COAL MINE	406-342-5841			
Name: Leanin Jefferson Title: ~~Jeff Rides The Bear~~	Crow Tribe	665-8557			
Name: Jeff Rides The Bear Title:	Crow Nation	638-3810			
Name: Title:					
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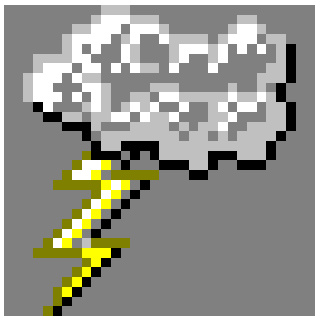
Rev. 4/23/03



CROW RESERVATION PRE-DISASTER MITIGATION PLAN MEETING:

AUGUST 1, 2006

10:00 a.m.

Location: Apsalooka Center

Open to the public.
Anyone with an interest is encouraged to attend and participate.
This is the second meeting of three for preparing a plan to reduce effects of disasters.

For more information, contact:
Acting Disaster Emergency Coordinator,
Susette Nanto-Spang, 638-3832

Dear Steering Committee Participants:

Thanks to all of you who participated in the first steering committee meeting! We're off to a good start.

Please plan on attending the second meeting to be held:

August 1, 10:00 a.m.- noon. LOCATION: Apsalooke Center

We encourage your attendance at this upcoming meeting, even if you missed the first.
The purpose of the next meeting will be to identify goals and objectives.

Attached is a news release with a summary of the last meeting and discussion of the overall project.

Sincerely,

Susette Nanto Spang

CROW RESERVATION
Pre-Disaster Mitigation Plan
Steering Committee/Public Meeting Agenda
August 1, 2006

- **Welcome and introductions**

- **Recap:**
  - Why do a CWPP/PDM Plan?
  - What is in the plan?
  - Discussion and products of first meeting

- **Critical Facilities and Vulnerable Populations**

- **Risk evaluation and hazard assessment**

- **Concerns/Issues (overall, general, for specific hazards)**

- **Develop goal statements and preliminary list of projects**

- **Wrap-up**
  - **Comments/questions on meeting**
  - Review schedule
  - Next steps, next meeting (Sept 6—location??)
    - Finalize, prioritize, cost-benefit

Meeting Summary
Crow Tribe Pre-Disaster Mitigation (PDM)
Steering Committee
Conference Room-Basement of Tribal Offices
August 1, 2006

Welcome

Anne Cossitt, contractor to the Crow Tribe to prepare the plan, briefly reviewed the agenda and indicated that this is the second of three meetings of the PDM Steering Committee. The purpose of this meeting is to set goals and identify projects to reduce risks.

The group introduced themselves.

Background-Recap of work to date

Cossitt briefly reviewed what a PDM plan is, incentives for developing such a plan, and roles of the steering committee, contractor, tribal council, public, etc. in developing the PDM plan. Summaries of the first meeting were distributed.

Critical Facilities and Vulnerable Populations

Cossitt passed out an initial draft list of critical facilities and vulnerable populations. Cossitt explained that the list had columns that addressed key information items needed for FEMA review. These include estimated value or replacement cost (if the structure were damaged or destroyed).

Bernadette Smith, member from Pryor, requested addition of the Pryor Post office to the list. No other changes were made at the meeting. Any other changes could be made by contacting Susette Nanto Spang or Anne Cossitt (cossitt@usadig.com).

Existing Disaster Preparedness and Response

Cossitt passed out a one-page list of issue topics related to existing disaster preparedness and response for the Crow Tribe and then she facilitated discussion of each topic.

- Tribal DES Coordinator: Susette Nanto Spang is the DES Coordinator, but she holds several other positions as well. It is difficult to staff all the various functions and provide adequate staffing for the TERC.
- TERC: The Tribal Emergency Response Committee meets quarterly.
- Emergency Operations Plan: The plan is basically done—next steps:
    - Finish the plan
    - Get formal approval of plan from Tribal Chairman

    - Get copies of the plan out to the various entities who should have a copy. Issue with cost of preparing hard copies—consider sending out cds.
- Emergency Operations Center: Locations need to be clear and identified in the EOP (double check).
- Evacuation Plan(s): in EOP
- Evacuation Shelters: Typically the schools in each community.
    - DES Coordinator needs to contact the schools and work them to establish protocol and needs (e.g., back-up power supply, adequate space for shelters, etc.)
- Coordination with Other Response Teams: EOP describes coordination among Crow Tribe, BIA, Northern Cheyenne, and Big Horn County to avoid overlap and confusion during an emergency.
    - Should develop memoranda of understanding among the various entities for the EOP.
    - Need to share the final plan with other entities.
- Training Exercises: Crow usually participates in cooperative exercises with other jurisdictions, e.g., Big Horn County. Could have better participation from various departments (e.g., law enforcement)
- Warning Systems: Existing warning systems are notices over "regular" radio and also via Channel 13, cable TV.
- NOAA weather radios: Unclear which, if any, critical facilities (e.g., schools, clinics) have NOAA weather radios.

Risk Evaluation and Hazard Assessment

Cossitt distributed a draft summary of the risk evaluation and hazard assessment. Each of the hazards identified at the first meeting, as well as a few others, were included in the summary. Hazards identified at the first meeting are listed in the priority order from the first meeting.

The group reviewed each hazard, identifying existing mitigation measures, issues, opportunities, needs, and potential future measures as follows. For some hazards, no new items were identified to add to the risk evaluation and hazard assessment.

Winter Storms

Comments:

- We need to keep the roads plowed—people can get stranded. We don't always know who is responsible for road plowing (county, BIA, Tribe). Need to identify mechanisms to plow the roads as necessary.
- Need to identify school routes and keep those plowed.
- Need to improve access to livestock in bad snow storms.
- Greater awareness about how to prepare and respond to winter storms among older tribal members. Younger generations haven't experienced

much severe winter weather (or only a few events). Need to start education for youth about how to prepare.
- Schools need to be part of the awareness program—both in terms of educating younger children and also about providing notification to parents/guardians when children are going to be sent home early from school during bad weather events.

Power Outages

Comments:
- Lodge Grass school needs a back-up power generator that works. Get the old one fixed. May not cost more than $1,000 to fix. State Farm insurance may be able to help on cost.
- DES Coordinator needs to meet with schools and work out details for evacuation shelters with them (including issues of back-up power). Start first with Lodge Grass since at least one person at meeting suggested they may be getting rid of their back-up generator.
- All evacuation shelters need to be adequately supplied with back-up power (not just the schools—the Apsalooke Multi-purposeCenter, etc. also need back-up power)
- Prune tree limbs that might break and cause power outages during wind/ice storm events. Power Company might assist?
- Replace old power poles that might break or fall during severe weather events. Power Company role?
- Critical facilities need to be reviewed for back-up power needs. Meeting participants identified the following:
    - Have back-up power: (but need to determine extent)
        - Tribal Offices
        - Jail
        - Forestry
        - Hospital
    - Need back-up power
        - Dialysis Center
        - BIA Law Enforcement
        - Multi-purpose Center
- Need public education about preparing for power outages—for adults and children—reminders that cordless phones do not work during power outages

Wildland Fire

Comments:
- Crow participated in the detailed Community Wildfire Protection Plan prepared by Big Horn County. Use what is relevant for the Crow plan.

Hazardous Materials

Comments:

- First responders need training (including law enforcement)
- Need better communication and coordination among BIA, IHS, National Park Service
- In process of developing a Level B Haz Mat Team—have the suits

Flooding

Comments:

- Use aerial photos of 1978 flooding to site new development
- Identify the pros and cons of participating in the NFIP program
    - Have FEMA come and present to the tribe

Communications

Comments:

- Working on a centralized dispatch system (contact Rhetta Rau, IT for the tribe)
- Ensure that tribe's radios meet standards of Interoperability Montana
- Need to coordinate the # of persons on one channel/one frequency—it can get too confusing and can't communicate. Had a near crash with a helicopter and airplane because of that problem.

Drought

Comments:

- Need some discussion about trade-offs among water uses during a drought—how do we address needs for farming irrigation, public water supplies, wildlife needs, in-stream flows for fish?
- Are there minimum in-stream flow requirements on the rivers and streams on the Crow Reservation?
- Concern that irrigation is drying up rivers and streams

Develop Goal Statements and Preliminary List of Projects

Cossitt briefly reviewed the difference between goals, objectives, and action items or projects. Cossitt proposed to the group that she would organize these items and develop some draft goal statements for review by the PDM steering committee at the next meeting.

Wrap-Up

Cossitt thanked everyone for their participation and ideas.

The next meeting date is set for September 6, from 10 a.m. to noon. Location will likely be the Apsalooke Multi-purpose center.

Purpose of the next meeting will be to finalize and prioritize goals and projects, and develop a work implementation process and schedule.

MEETING HANDOUTS

1. List of Critical Facilities and Vulnerable Populations
2. General Disaster Preparedness and Response/Current Status and Potential for Improvement (List of Discussion Topics)
3. Risk Evaluation and Hazard Assessment –Initial matrix

Attendance Sheet

Activity: CROW - PDM STEERING Comm

Location: Crow Agency Date(s): 08-01-06

Duration: At 10 am — 12:30 pm.

Name & Title	Affiliation	E-Mail Address & Phone#	Agency Use Only H	M	T
Name: William Driftwood, Sr.	Tribe	williamd@crownations.net			
Title: DES					
Name: Julie Rideshorse	Crow Head Start	jras_ota@yahoo			
Title: Nutrition Health & Safety Spec.		638-3740			
Name: Carolyn Morrison	Nat Res.	carolynm@crownation.net			
Title: GAP Coor. EPA	Tribe	638-3903			
Name: Burton Pretty On Top	Crow Tribe	burtonp@crownations.net			
Title: Public Relations Director		638-7312			
Name: Bob Crane	Local Business	bobdeb@bhci.net			
Title: Business Ins. Agent		665-1006			
Name: PAT SCHWAIGERT	BH COUNTY PH DEPT	pschwager@co.bighorn.mt.us			
Title: CO. HEALTH NURSE		665-8729			
Name: Charlene Johnson	Indian Health Service	Charlene.Johnson@ihs.gov			
Title: Service Unit Director		638-3468			
Name: BERNADETTE SMITH	TRIBE/PRYOR COMMUNITY/CHIEF PLENTY COUPS STATE PARK	PRYOR MT 59066			
Title: MUSEUM ASSISTANCE CP/C/S/P					
Name: SUSETTE NANTO-SPANG	CROW TRIBE	williamd@CrowNation.Net			
Title: DES					
Name: Tori Vanbott	Crow Tribe				
Title: Public Relations Asst.					
Name: Kurrie Small	CROW TRIBE	Kurrie@crownations.net			
Title: Environmental Coor.					
Name: Laura Rides Horse	CROW TRIBE	Laurar@crownations.net			
Title: Natural Res Coord.		Henryr@CrowNation.net			
Name: Henry Rides Horse Jr.	Crow Tribe				
Title: Natural Resource Cabinet					
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CROW TRIBE
PRE-DISASTER PLANNING MEETING

Wednesday, September 6, 2006
10:00 a.m.-Noon
Location: Apsalooka Multi-Purpose Center

Open to the public.
Anyone with an interest is encouraged to attend and participate.
Meeting purpose is to finalize and prioritize goals and projects.

For more information, contact:
Disaster Emergency Coordinator, Susette Nanto-Spang, 638-3832

Dear Steering Committee Participants:

Please plan on attending the third and final steering committee meeting for the Crow Pre-Disaster Mitigation Plan. Purpose of the meeting will be to finalize and prioritize goals and objectives.

Meeting will be held:

September 6. 10 a.m.- noon at the Apsalooka Multi-Purpose Center.

If the Apsalooka Center is being used as the Incident Command Center for a wildfire or other emergency, the meeting will be held at the Crow Tribal Offices.

We encourage your attendance at this upcoming meeting, even if you missed the first two meetings.

Attached is a summary of the last meeting.

If you have any questions, please contact Susette Nanto Spang (LIST A TELEPHONE NUMBER WHERE PEOPLE WHO ANSWER WILL KNOW ABOUT THE PROJECT AND CAN TAKE MESSAGES) or Anne Cossitt, Contractor to the Crow Tribe, at 633-2213.

Sincerely,

Susette Nanto Spang

FOR IMMEDIATE RELEASE **August 28, 2006**

Contact: ***Susette Nanto Spang, Acting Crow Disaster and Emergency Services Coordinator, 638-3832***
Anne Cossitt, Contractor for Crow Tribe Disaster Planning, 406-633-2213

FINAL MEETING FOR PRE-DISASTER MITIGATION PLANNING

The third of three public meetings to prepare a Draft Pre-Disaster Mitigation Plan for The Crow Reservation is scheduled for September 6 from 10 a.m. to noon at the Apsalooka
Multi-Purpose Center in Crow Agency. The public is invited to attend.

Meeting results will be incorporated into a Draft Plan that will be released for public review and comment sometime later this Fall. The purpose of the plan is to identify what can be done in advance to lessen the impacts of disasters.

Once adopted by the Tribal Chair, projects in the plan may become eligible for competitive funding from the Federal Emergency Management Agency.

Participants at the second steering committee meeting held on August 1, 2006 identified a number of existing emergency response efforts as well as some specific needs. Existing measures include the Crow Tribal Emergency Response Committee (TERC), with representation from first responders—law, fire, health, and other emergency services. The Crow Tribe is close to completing an Emergency Operations Plan. Participants at the August meeting discussed a variety of emergency hazards—including winter storms, power outages, and wildfires. Specific needs included the need to identify evacuation shelters and to ensure that those facilities have adequate supplies, communication, and back-up power.

At the September 6 meeting, participants will finalize and prioritize goals and objectives for the plan.

If you would like more information about the planning process or to learn how to get involved, you can contact Crow Disaster Emergency Coordinator, Susette Nanto Spang at 638-3832.

Crow PDM PLAN
Steering Committee/Public Meeting Agenda
September 6, 2006

Welcome/introductions

Quick Review

Purpose of PDM Plan
Where we are in the planning process
Today's tasks

Goals and Objectives

Background
Got it Right? Anything left out?
Project Cost-Benefit

- Number of lives at risk
- Value of property at risk
- Infrastructure at risk
- Risk of business interruption or loss
- Other?

Prioritizing Projects

- Cost/benefit of the project
- Need (urgency)
- Technical Feasibility/Difficulty
- Political-public feasibility--Public acceptance

Scheduling Projects

Wrap-up
Schedule for finalizing the plan
Where to find copies
How to comment
Thank you for your participation!

Meeting Summary
Crow Tribe Pre-Disaster Mitigation (PDM)
Steering Committee
Conference Room-Basement of Tribal Offices
September 6, 2006

Welcome

Anne Cossitt, contractor to the Crow Tribe to prepare the plan, briefly reviewed the agenda and indicated that this was the third of three meetings of the PDM Steering Committee. The purpose of this meeting is to finalize and prioritize goals and projects.

The group introduced themselves.

Background-Recap of work to date

Cossitt briefly reviewed what a PDM plan is, incentives for developing such a plan, and roles of the steering committee, contractor, tribal council, public, etc. in developing the PDM plan. Summaries of the second meeting were distributed.

Goals and Objectives

Cossitt explained that she had taken the projects and concepts that had emerged from the last meeting and drafted goals, objectives and projects for review at this meeting.

Cossitt reviewed the following criteria for comparison of cost-benefits among goals, objectives, and projects:

- Number of lives at risk
- Value of property at risk
- Infrastructure at risk
- Risk of business interruption or loss

Participants considered cost-benefit to include an emphasis on cost-effective and technically feasible mitigation actions.

Cossitt also suggested the following criteria for prioritizing projects:

- Cost/benefit of the project
- Need (urgency)
- Technical Feasibility/Difficulty
- Political-Public feasibility- Public Acceptance (or not)

The group then proceeded to review and discuss the draft goals and objectives. At the end of the meeting, the group went through each objective and ranked them high, medium, or low priority.

Additions and changes from the group's discussion are noted as revisions to the "DRAFT GOALS AND OBJECTIVES" table that was handed out at the meeting.

Discussion items not included on the table are listed below. These items were not directly linked to goals and objectives.

- Room in Forestry could be used as an emergency operations center

- Coordinating emergency services at Crow Fair. There was a fire last year. Learned that 4-wheelers are most effective at getting around. Need to continue to plan for and improve on this one.

- Getting information on road conditions is difficult. Fellow from the radio station indicated that when he has called BIA in the past, he's been referred to a number in Washington DC…..

- Human-cause fires particularly a problem in Lodge Grass
- Flooding is a particular problem in Lodge Grass

- Potential hazardous material spill or general traffic accident potential with all the new truck drivers on the Sarpy Road (coming from the Apsalooke mine to the power plant in Hardin.

- William and Susette met with Lodge Grass schools to work out use of the school as emergency shelter—they've got the back-up generator working—it needed a new tank….

- Add diseases to list of things to be prepared for—major communicable diseases (e.g. bird flu, etc.)

Cossitt said that she would take the work of the group and complete the rest of the table. Having projects identified as high, medium, or low priority is an important step in developing a schedule. Cossitt referred to the draft guidelines for listing a cost estimate for the projects as high, medium, or low cost. There were no additional comments.

Wrap-up

The next step will be to incorporate this information into the plan document. Cossitt indicated the plan would be ready as a draft for public review in approximately 6 weeks. She will send the draft to the DES office. **Hard copies**

will be available in various locations and copies on compact disk also available. The comment period will be 30 days.

Once the comment period is over, changes will be considered and finalized and the document submitted to the Tribal Chair for adoption. Once adopted, it will be reviewed by FEMA to make sure it meets all requirements. Once approved, the Crow Tribe will be able to submit projects for competitive funding.

MEETING HANDOUTS

1. Draft Goals and Objectives
2. Second meeting summary

FC 205

Attendance Sheet

Activity CROW PRE-DISASTER MITIGATION PLAN

Location CROW AGENCY Date(s) Sept 6, 2006

Duration 10 am - 12:30 pm

Name & Title	Affiliation	E-Mail Address & Phone#	Agency Use Only H	M	T
Name: Thomas YellowTail					
Title: Purpose Installation + Delivery	Lodge Grass Ambulance				
Name: Dr. David Yarlott, Jr.	LBHC	davidyarlott@lbhc.net			
Title: President		638-3107 CCUNT.US			
Name: Daryl Bends		639-2356-Office			
Title: Mayor - Lodge Grass, mt.	Lodge Grass	639-9134-Fax			
Name: Carolyn Morrison	Crow	638-3903			
Title: GAP Coordinator EPA	Tribe	CarolynM@CrowNations.net			
Name: William Driftwood		williamd@crow			
Title: Emergency Management	Crow Tribe	nations.net			
Name: Suzette NANTO-SPANG		William@crow			
Title: Public Safety/DES	Crow Tribe	Nation.Net			
Name: Joe Wallace	" "				
Title: Tribal Health (Tobacco Prevention)		[redacted]			
Name: KENT ATWOOD	Montana	katwood@mt.gov			
Title: State Hazard Mitigation Officer	D.E.S.	841-3960			
Name: Rick Southerly		RICK@BIGSKYRADIO.NET			
Title: KHDN RADIO	KHDN	665 2828			
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APPENDIX B

Selected portion of the Big Horn County Community Wildfire Protection Plan: Goals, Objectives, Strategies

(Crow Agency, Lodge Grass, and BIA Fire Departments cooperated in development of the plan

Excerpt from the
BIG HORN COUNTY COMMUNITY WILDFIRE PROTECTION PLAN

The following includes the Goals and Objectives for the Big Horn County Community Wildfire Protection Plan. Because a portion of the Northern Cheyenne Reservation overlaps with a portion of Big Horn County, members of the Northern Cheyenne BIA wildland fire department, Northern Cheyenne Tribal Fire Department, and Northern Cheyenne Tribal Schools (Busby) Fire Department participated in the development of the following goals and objectives.

The Northern Cheyenne may wish to implement those actions relevant to the Northern Cheyenne Reservation. Participants in the Big Horn County CWPP planning process encouraged cooperation among jurisdictions on fire suppression-related activities. It was understood by Big Horn County that they do not have jurisdiction on lands under the jurisdiction of the Northern Cheyenne Tribe.

Strategic Plan/Desired Condition

There is one overarching desired condition for Big Horn County:

Reduce the number and extent of wildfires in the County.

The desired condition is an acknowledgement that Big Horn County has an inordinately high number of human-caused fires; and terrain, fuel build-up, wind, and weather conditions that can quickly cause fires to grow out of control and endanger lives and property.

Wildfire and/or other significant disturbances are necessary in overall long-term ecosystem health. Managing wildfire to achieve ecosystem health can be achieved where it does not endanger lives or property. The fire management plans for the Crow and Northern Cheyenne recognize the importance of fire disturbance.

Goals, Objectives, Projects/Actions

GOAL 1: Ensure an effective, coordinated response to wildland fire.

Objective 1.1. Continue to improve coordination and communication among the various fire response entities.

1.1.1 Involve all fire response teams (public, private—e.g., for coal mines, oil and gas, etc.) in stakeholder groups and planning for fire response.

1.1.2 Hold an annual workshop to review past fire season and prepare for upcoming season. Include representatives of tribes, state and federal lands, private companies (BNSF, coal-bed methane companies, coal companies, etc.), and private landowners. Identify measures to reduce fuel loads, ensure fire fighting capabilities to protect industry infrastructure in the wildland areas (coal, oil, and gas facilities), coordinate efforts, etc.

Objective 1.2. Increase the numbers of trained volunteers throughout the county.

1.2.1 Build recognition for firefighters. Hold an annual firefighter appreciation day. Celebrate one or more outstanding firefighters.

1.2.2 Submit articles to the media about the importance of firefighters, recognizing outstanding individuals, and information on how to participate and who to contact.

1.2.3 Develop an outreach program for high school students to become members of volunteer fire departments. (e.g., presentations, coordinate with schools for credit for volunteer hours/training, etc.)

Objective 1.3. Provide for adequate water for fire fighting purposes.

1.3.1 In communities with public water supplies, secure adequate water supplies for firefighting purposes and annually assess the capabilities of each system, identifying needed maintenance or other issues, and identifying who will be responsible for repairs, maintenance, and upgrades as necessary. Specific short term needs include:

- Fort Smith
  - Immediate need: put fire hydrants at each end of the trailer park and ensure adequate flow
  - Ensure that all existing hydrants are in working condition
- Lodge Grass
  - Ensure that all hydrants are in working condition
  - Build additional water storage (current tank insufficient)
- Busby, Muddy Cluster, Rosebud, Eagle Feather, Wyola, Pryor, St. Xavier, and Crow Agency
  - Ensure that all hydrants are in working condition; upgrade existing hydrants as necessary, and add new hydrants (existing insufficient to serve needs)
  - Build additional water storage as necessary

1.3.2 Work with Fidelity and other coal-bed methane exploration and development companies to identify available water supply sources as they become developed through the extraction process. Coordinate adequate access into the facilities.

1.3.3 Equip underground water supplies (e.g., cisterns) in gas fields and other locations (such as fire suppression water supplies in new subdivisions) with standardized connections so that firefighters can withdraw water.

Objective 1.4 Improve access for firefighting equipment.

1.4.1 Provide information on the access requirements for firefighting equipment to homeowners throughout the county.

1.4.2 Encourage homeowners to work with the fire depts. and other homeowners to provide adequate access (e.g., methods to address security systems and/or poor roads that may impede access).

1.4.3 Identify and address problems with access on existing county roads (e.g., such as some county roads in the Pine Ridge area).

Objective 1.5 Ensure that equipment is adequate for fire suppression needs.

1.5.1 Annually review equipment and identify gaps and needs.

1.5.2 Continue to work to identify funding sources, such as grants, to acquire needed equipment.

Objective 1.6 Protect firefighters from loss of life and injury due to wildland fire.

1.6.1 Continue to provide training and extend training for staff and volunteers.

1.6.2 Continue to assure that there is adequate personal protective gear and communications upgrades as necessary.

Objective 1.7 Develop and maintain detailed resource information.

1.7.1 Develop a detailed map of critical infrastructure (e.g., power lines, roads, etc.), locations of fire fighting equipment and infrastructure, water sources, etc., and review and update annually.

1.7.2 Develop, review, and update annually a roster of contact information for fire fighting resources (both in-county and those available out-of-county), with names of contacts, lists of equipment, and other information useful for firefighting.

1.7.3 Identify a GIS technician and other technical assistance in the county (or work with other counties for such resources) to develop, coordinate and update GIS maps (such as the detailed map above) and the detailed roster information on a regular basis

GOAL 2: Protect the public from loss of life or injury from wildland fire.

Objective 2.1. Ensure that residents know how to respond to wildfire situations.

2.1.1 Provide information about personal safety in a wildfire situation and distribute via the media and presentations at schools, etc.

2.1.2 Make sure that steps to reporting a fire are clear to residents. Review the telephone books annually to ensure that information is correct.

2.1.3 Annually provide a workshop or training session for individuals who may find themselves as first responders to fire. Session would include safety training, etc.

Objective 2.2. Ensure efficient 911 dispatch.

2.2.1 Annually review existing 911 system and identify any issues, need for drills/exercises, or staff training.

Objective 2.3. Reduce post-fire impacts to public health and safety.

2.3.1 Provide public education about how to reduce post-fire impacts, such as potential impacts to water supply sources after a fire, potential for mudslides, increased for potential for noxious weeds, etc.

2.3.2 Public agencies to develop and follow post-fire procedures to reduce impacts.

Objective 2.4 Develop fire evacuation plans.

2.4.1 Identify “safe areas” and evacuation plans for each community in the county.

GOAL 3: Reduce fuel loads and create defensible space in high and moderate risk areas.

Objective 3.1 Continue and expand programs to create and maintain fire breaks.

3.1.1 Continue to mow and/or plow fire breaks around communities at risk. Crow and Northern Cheyenne have been doing this for many of the identified at-risk communities on the reservations. Identify any at-risk communities that do not have fire breaks, evaluate need, and implement as necessary.

3.1.2 Continue to mow along roads in the county and to do this early in the fire season.

3.1.3 Assess need and implement as necessary fire breaks around communication facilities, including radio repeater stations.

Objective 3.2 Reduce fuel loads and create defensible space in and around identified communities at risk.

3.2.1 Continue to implement the actions identified for Muddy Cluster in the Wildfire Hazard Assessment and Mitigation Plan (Northern Cheyenne Reservation).

3.2.2 Continue to implement actions identified in the Crow Fire Management Plan.

3.2.3 Complete the Hazard Assessment and Mitigation Plan for the Crow Reservation and implement recommendations.

3.2.4 Work with residents and landowners in the Pine Ridge and Sarpy-Tullock areas as individuals or in small groups to identify areas of fuel build-up (especially in areas with structures), options to address, and means to implement (including resources for assistance). Options can include thinning and pruning the understory, overstory treatment, prescribed fire, and other means to create defensible space.

3.2.5 For Lodge Grass--address fuel build-up and unmanaged fuels:

a) Remove vacant structures (including abandoned vehicles)
b) Clean up vacant lots; maintain and reduce weed growth.
c) Trim dead and dying limbs from trees and shrubs on a regular basis.
d) Maintain alleyways clear of debris and fuels.
e) Prohibit trash burning and fireworks in town.
f) Remove abandoned ignitable storage tanks (such as at old gas station).

3.2.6 For areas along the Big Horn River from Fort Smith to Treasure County (starting with those in the Fort Smith and St. Xavier areas):

a) Work with landowners to identify particular hazard areas, including areas with dead-end roads or other transportation issues (e.g., gated and locked entries) that make it difficult or impossible for fire responders to access their properties
b) Work with seasonal residents to identify best practice measures to protect their properties year-round.

3.2.7 For all other areas in the county: Work with local residents and landowners to identify areas of fuel build-up and means to address.

3.2.8 Work with Burlington Northern Santa Fe (BNSF) to participate in mowing or prescribed burns along the rail corridor to reduce fuel build-up.

3.2.9 Annually review the status of fuel build-up and identify fuel reduction program status for various agencies---state (DNRC), federal (BLM, National Park Service, Bureau of Reclamation), local (county and towns), and tribal (Crow, Northern Cheyenne, BIA).

GOAL 4: Raise public awareness geared to reduce the number of human-caused fires and improve wildland and structural defensibility.

Objective 4.1. Develop a public education campaign on wildfire awareness, need to create defensible space, and role of fire in the ecosystem.

4.1.1 Identify and fund a staff person to provide public education on fire preparedness (and preparedness for other disasters), and to provide the staffing for the numerous other education and outreach projects in this CWPP.

4.1.2 Develop programs geared to school-age children about fire safety and utilizing techniques to prevent experimentation with fire and arson.

4.1.3 Provide education on ways to make properties less susceptible to wildfire, understanding wildfire, and role of fire (and/or other disturbance) in long-term land health/productivity. Tailor programs/information for the general public as well as owners and managers of cropland, grazing land, harvestable timber, and recreation resources (such as fishing/hunting lodges, fishing/hunting guides, marinas, etc.) Mechanisms can include presentations for existing groups, e.g., Conservation District meetings, grazing associations or other groups, meetings in various communities, notices in mail, articles and inserts in the local papers, working with insurance companies, power companies and others to distribute information via bills and public announcements, etc.

4.1.4 Sponsor community Fire clean-up day and/or other special events in communities throughout the county. Work with schools, church groups, and others to participate.

GOAL 5: Ensure new developments are designed for adequate fire protection.

Objective 5.1. Review proposed subdivisions for fire safety.

1.1.1 Review and revise as necessary the subdivision regulations to address fire safety needs.

1.1.2 Review subdivision applications to make sure they meet fire safety requirements.

1.1.3 Develop a building code for fire safety purposes (using the NFPA codes as a starting point).

Objective 5.2. Provide education about wildfire issues to persons who are planning to build in areas not subject to subdivision review.

5.2.1 Update the “Way of the West” publication that was prepared by the county (or prepare another different publication) to inform new and

existing residents about what to expect in rural Big Horn County. Include information on wildfire issues and response times.

5.2.2 Work with tribal governments and housing authorities in order that new housing and other developments are built in defensible areas.

GOAL 6: Reduce effects of wildfire on cultural and historic sites.

6.1 Work with owners and managers of recorded sites (including National Park Service battlefield sites, Rosebud Battlefield, Chief Plenty Coups State Park) to share fire suppression plans with local fire entities to familiarize responders with issues specific to the site.

6.2 Expand public awareness about the need to protect these sites.

6.3 Continue to work with landowners and other trustees of sites on an incident basis to identify sites and secure sites that are within reach of a fire.

6.4 Develop and incorporate policies and methods for dealing with historic and cultural sites into fire agency standard operating procedures. Consider using outside assistance as part of an annual workshop/training to develop these procedures.

APPENDIX C

RECORD OF REVIEW

EXHIBITS 4A AND 4B

From FEMA “How-to-Guide” - #8, Exhibits 4A and 4B

Exhibit 4A: Record of Review
Record of the review and incorporation of existing programs, policies, and technical documents for a single local jurisdiction.

(Name of Jurisdiction)___**CROW INDIAN RESERVATION**

Existing Program/Policy/ Technical Documents	Does the jurisdiction have this program/ policy/ technical document? (Yes/No)	Reviewed by Plan Authors? (Yes/No)	Method of incorporation into the hazard mitigation plan
PLANS			
Comprehensive Plan	no	NA	[1]
Capital Improvements Plan	no	NA	[1]
Redevelopment Plan	no	NA	[1]
Area Plan	no	NA	[1]
Watershed Management Plan	no	NA	[1]
Post Disaster Recovery Plan	no	NA	[1]
Comprehensive Emergency Management Plan	yes[2]	yes	[1]
Regional Development Plan	no	NA	[1]
Special Function Plans	no	NA	[1]
• Downtown redevelopment	no	NA	[1]
• Airport	no	NA	[1]
• Land buyout program	no	NA	[1]
• Long-range recreation facilities plan	no	NA	[1]
• School siting plan	no	NA	[1]
• Open space plan	no	NA	[1]
• Transportation improvement-retrofit programs	no	NA	[1]
• Water and sewer construction/retrofit programs	no	NA	[1]

Existing Program/Policy/ Technical Documents	Does the jurisdiction have this program/ policy/ technical document? (Yes/No)	Reviewed by Plan Authors? (Yes/No)	Method of incorporation into the hazard mitigation plan
CODES, ORDINANCES, REGULATIONS AND GUIDELINES			In Chapter 1, notes that these regulations are scheduled to be updated but update is not complete[3]
Building codes	no	NA	[1]
Land development codes	no	NA	[1]
Zoning Ordinance	no	NA	[1]
Historic Preservation Ordinance	no	NA	[1]
Floodplain Ordinance	no	NA	[1]
Tree Protection Ordinance	no	NA	[1]
Landscape Ordinance	no	NA	[1]
Subdivision Regulations	no	NA	[1]
Development guidelines	no	NA	[1]
PROGRAMS			
Beach conservation and restoration program	no	NA	NA
Local and/or regional emergency evacuation program[4]	no	NA	[1]
Historic preservation district program	no	NA	[1]

[1] Although the jurisdiction does not have many current policies, plans, etc. there is a possibility that could change in the future. The PDM plan states that projects in the CWPP/PDM Plan can be incorporated as appropriate into existing plans, annual budgets, and any relevant future plans that may be developed or updated for the Crow.

[2] As part of the Crow Emergency Operations Plan (EOP). There is no plan specifically called Comprehensive Emergency Management Plan. The EOP was not finalized or formally adopted by the Crow Tribe at the time this PDM was prepared.

[3] The existing codes and regulations are not currently used.

[4] Evacuations are addressed in the emergency operations plan. There is no separate "program."

Exhibit 4A: Record of Review
Record of the review and incorporation of existing programs, policies, and technical documents for a single local jurisdiction.

(Name of Jurisdiction)___TOWN OF LODGE GRASS_____
Note: Lodge Grass has a population of 510 persons per the 2000 census. They have a limited budget, few staff, and few programs, policies, and technical documents at the current time related to implementing the PDM plan.

Existing Program/Policy/ Technical Documents	Does the jurisdiction have this program/ policy/ technical document? (Yes/No)	Reviewed by Plan Authors? (Yes/No)	Method of incorporation into the hazard mitigation plan
PLANS			
Comprehensive Plan	no	NA	Plan Maintenance and Coordination section[1]
Capital Improvements Plan	no	NA	[1]
Redevelopment Plan	no	NA	[1]
Area Plan	no	NA	[1]
Watershed Management Plan	no	NA	[1]
Post Disaster Recovery Plan	no	NA	[1]
Comprehensive Emergency Management Plan	no[2]	NA	[1]
Regional Development Plan	no	NA	[1]
Special Function Plans	no	NA	[1]
• Downtown redevelopment	no	NA	[1]
• Airport	no	NA	[1]
• Land buyout program	no	NA	[1]
• Long-range recreation facilities plan	no	NA	[1]
• School siting plan	no	NA	[1]
• Open space plan	no	NA	[1]
• Transportation improvement-retrofit programs	no	NA	[1]
• Water and sewer construction/retrofit programs	no	NA	[1]

Existing Program/Policy/ Technical Documents	Does the jurisdiction have this program/ policy/ technical document? (Yes/No)	Reviewed by Plan Authors? (Yes/No)	Method of incorporation into the hazard mitigation plan
CODES, ORDINANCES, REGULATIONS AND GUIDELINES			
Building codes	no	NA	[1]
Land development codes	no	NA	[1]
Zoning Ordinance	yes[3]	Via conference with city officials	[3]
Historic Preservation Ordinance	no	NA	[1]
Floodplain Ordinance	yes[3]	Via conference with city officials	[3]
Tree Protection Ordinance	no	NA	[1]
Landscape Ordinance	no	NA	[1]
Subdivision Regulations	no	NA	[1]
Development guidelines	no	NA	[1]
PROGRAMS			
Beach conservation and restoration program	no	NA	NA
Local and/or regional emergency evacuation program	no	NA	[1]
Historic preservation district program	no	NA	[1]

[1] Although the jurisdiction does not have land use policies, plans, etc. there is a possibility that could change in the future. The PDM plan states that projects in the CWPP/PDM Plan can be incorporated as appropriate into existing plans, annual budgets, and any future land use plans that may be developed or updated for the Reservation or Lodge Grass.

[2] No separate Emergency Operations Plan for municipality, but is generally covered under the Big Horn County EOP.

[3] Lodge Grass had land use codes and regulations at one time, but they are no longer in use.

Exhibit 4B: Record of Review (Summary)
Record of the review of existing programs, policies, and technical documents for all participating jurisdictions

Existing Program/Policy Technical Document	Crow Reservation	Lodge Grass
Comprehensive Plan	NA	NA
Capital Improvements Plan	NA	NA
Redevelopment Plan	NA	NA
Area Plan	NA	NA
Watershed Management Plan	NA	NA
Post Disaster Recovery Plan	NA	NA
Comprehensive Emergency Management Plan	√[1]	NA
Regional Development Plan	NA	NA
Special Function Plans		
• Downtown redevelopment	NA	NA
• Airport	NA	NA
• Land buyout program	NA	NA
• Long-range recreation facilities plan	NA	NA
• School siting plan	NA	NA
• Open space plan	NA	NA
• Transportation improvement-retrofit programs	NA	NA
• Water and sewer construction/retrofit programs	NA	NA
CODES, ORDINANCES, REGULATIONS AND GUIDELINES		
Building codes	NA	NA
Land development codes	NA	NA
Zoning Ordinance	NA	NA
Historic Preservation Ordinance	NA	NA
Floodplain Ordinance	NA	NA
Tree Protection Ordinance	NA	NA
Landscape Ordinance	NA	NA
Subdivision Regulations	NA	NA
Development guidelines	NA	NA
PROGRAMS		
Beach conservation and restoration program	NA	NA
Local and/or regional emergency evacuation program[2]	NA	NA
Historic preservation district program	NA	NA

NA = the jurisdiction does not have this program/policy/technical document
0 = the jurisdiction has the program/policy/technical document, but did not review/incorporate into the multi-hazard mitigation plan
√ = the jurisdiction reviewed the program/policy/technical document

[1] Emergency Operations Plan in process of being finalized.
[2] Evacuations are addressed in the emergency operations plan. There is no separate "program."

APPENDIX D

BACKGROUND INFORMATION ON COMMUNITY STORM SHELTERS

INFORMATION FROM FEMA

Excerpted from: http://www.fema.gov/fima/fema361.shtm on February 9, 2007

Design and Construction Guidance for Community Shelters

FEMA 361

FIRST EDITION July 2000

This document is a guidance manual for engineers, architects, building officials, and prospective shelter owners. It presents important information about the design and construction of community shelters that will provide protection during tornado and hurricane events. For the purpose of this manual, a community shelter is defined as a shelter that is designed and constructed to protect a large number of people from a natural hazard event. The number of persons taking refuge in the shelter will typically be more than 12 and could be up to several hundred or more. These numbers exceed the maximum occupancy of small, in-residence shelters recommended in FEMA 320: Taking Shelter From the Storm: Building a Safe Room Inside Your House.

To order a copy of this Publication, call the FEMA Publications Distribution Facility at 1-800-480-2520 and ask for FEMA 361. The FEMA shelter benefit/cost model, is provided on a CD-ROM as part of Appendix A. The CD-ROM also includes a detailed User's Guide that contains instructions for installing the B/C model software and conducting sample runs. The User's Guide is provided in the form of a Portable Document Format (PDF) file.

FEMA 361 is also available in interactive PDF format below.
Each PDF below contains an individual chapter Bookmark Table of Contents, Thumbnail views, and internal links to ease navigation throughout the publication. NOTE: Downloaded PDFs must be kept in the same directory to work properly.

FEMA361 Front Matter -- Includes Cover, Preface, interactive and fully linked Table of Contents, Project Team, Acknowledgments, Review Committee, and Acronyms and Abbreviations sections. (PDF 1.3MB)

Chapter 1 -- Introduction (PDF 144K)

Chapter 2 -- Protection Objectives (PDF 3.5MB)

Chapter 3 -- Characteristics of Tornadoes and Hurricanes (PDF 948KB)

Chapter 4 -- Shelter Types, Location, and Siting Concepts (PDF 1.2MB)

Chapter 5 -- Load Determination and Structural Design Criteria (PDF 1.7MB)

Chapter 6 -- Performance Criteria for Debris Impact (PDF 2.0MB)

Chapter 7 -- Additional Considerations (PDF 708KB)

Chapter 8 -- Human Factors Criteria (PDF 100KB)

Chapter 9 -- Emergency Management Considerations (PDF 3MB)

Chapter 10 -- Design Commentary (PDF 1.3MB)

Chapter 11 -- References (PDF 48KB)

Appendix A -- Benefit/Cost Analysis Model for Tornado and Hurricane Shelters (PDF 40KB)

Appendix B -- Site Assessment Checklists (PDF 3.8MB)

Appendix C -- Case Study I -- Stand-Alone Community Shelter (North Carolina) (PDF 296KB)

Appendix D -- Case Study II -- School Shelter Design (Kansas) (PDF 104KB)

Appendix E -- Wall Sections That Passed the Missile Impact Tests (PDF 744KB)

Appendix F -- Doors and Hardware That Passed the Missile Impact Tests (PDF 60KB)

Appendix G -- Design Guidance on Missile Impact Protection Levels for Wood Sheathing (PDF 536KB)

For more about tornadoes, please visit the National Oceanic and Atmospheric Administration (NOAA) web site tornado section.

FEMA 500 C Street SW, Washington, D.C. 20472
Disaster Assistance: (800) 621-FEMA, TTY (800) 462-7585